
User's Manual

ROTAMASS 3 Series
Coriolis Mass Flow and Density Meter
Integral Type RCCT3
Remote Type RCCF31 + RCCS3
Remote Type RCCR31 + RCCS3

IM 01R04B04-00E-E

vigilantplant.[™]

Contents

1. INTRODUCTION.....	1-1
1.1 Using the Coriolis Flowmeter Safely	1-2
1.2 Warranty	1-3
1.3 Instruction according EMC.....	1-3
1.4 ATEX Documentation	1-4
1.5 Disposal, Cleaning and Return	1-5
1.6 Confirmation of accessories	1-8
2. TRANSPORTATION AND STORAGE.....	2-1
3. PRODUCT DESCRIPTION.....	3-1
3.1 The functional principle	3-1
3.2 The Integral Type RCCT34 to 39/IR	3-2
3.3 The Remote Field-Mount Converter RCCF31	3-2
3.4 The Remote Rack-Mount Converter RCCR31	3-3
3.5 The Remote Detector RCCS30 to 33	3-4
3.6 The Remote Detector RCCS30 to 33 /Tx	3-4
3.7 The Remote Detector RCCS34 to 39/IR.....	3-5
3.8 The Remote Detector RCCS34 to 39/IR /Tx	3-6
3.9 The Remote and Integral Type RCCx39/XR.....	3-7
3.10 Measurement system and applications	3-8
3.11 Name Plates	3-9

4. INSTALLATION	4-1
4.1 General	4-1
4.2 Mounting of detector RCCS30 to 33 option /PD	4-2
4.3 Piping	4-2
4.4 Customer insulation	4-6
4.5 Mounting of converter RCCF31 to 2-inch pipe	4-6
4.6 Mounting of converter RCCR31 in a subrack	4-7
4.7 Alteration of display (RCCT3 / RCCF31)	4-7
4.8 Wiring	4-8
4.8.1 General items	4-8
4.8.2 Ground (earth) connections	4-10
4.8.3 Wiring technique	4-11
4.8.4 Assembling and connecting the Remote Cable RCCY03	4-12
4.8.5 Power supply wiring	4-15
4.8.6 Connecting to external instruments	4-18
4.8.7 Connecting HART- Communication	4-22
4.8.8 Flowmeters with intrinsic safe outputs	4-22
5. BASIC OPERATING PROCEDURES	5-1
5.1 Liquid crystal display	5-1
5.2 Display modes	5-3
5.3 Setting via keys	5-4
5.4 Examples of parameter settings via keys	5-5
5.4.1 Display configuration, set volume flow to line 1	5-5
5.4.2 Setting Temperature 20-120°C to Analog Output 2	5-6
5.5 Setting parameters in converter with option /NC	5-8
5.6 Zero adjustment (Autozero)	5-9

6. OPERATION VIA HART.....	6-1
6.1 Conditions of communication line	6-1
6.2 Communication via FieldMate.....	6-2
6.3 Communication via HART Communicator.....	6-5
6.4 Unique functions of HART Communicator	6-6
6.5 Transmitting device variables via HART.....	6-7
6.6 Hardware Write Protect.....	6-8
7. PARAMETER DESCRIPTION.....	7-1
7.1 Overview	7-1
7.2 Parameter list	7-2
7.3 Parameter tree, Display menu.....	7-21
7.4 Parameter tree, HART menu.....	7-51
7.5 Mass flow functions (Basic or Detailed Setup).....	7-83
7.6 Volume flow functions (Basic or Detailed Setup).....	7-84
7.7 Density functions (Basic or Detailed Setup)	7-85
7.8 Temperature functions (Basic or Detailed Setup)	7-86
7.9 Velocity functions (Detailed Setup)	7-86
7.10 Analog 1 functions (Basic or Detailed Setup).....	7-87
7.11 Analog 2 functions (Basic or Detailed Setup).....	7-88
7.12 Pulse/Status output 1 functions (Basic or Detailed Setup)	7-89
7.13 Pulse/Status output 2 functions (Basic or Detailed Setup)	7-93
7.14 Status input functions (Basic or Detailed Setup)	7-94
7.15 HART output (Detailed Setup).....	7-95
7.16 Totalizer functions (Basic or Detailed Setup)	7-96
7.17 Flow direction function (Detailed Setup)	7-97
7.18 Concentration measurement (Detailed Setup)	7-98
7.19 Net flow (Detailed Setup).....	7-99
7.20 Slug detection (Detailed Setup)	7-100
7.21 Empty pipe detection (Detailed Setup)	7-101

7.22 Corrosion detection (Detailed Setup).....	7-102
7.23 Detector data (Detailed Setup).....	7-102
7.24 Autozero (Diag/Service).....	7-103
7.25 Reading maximum fluid temperature (Detailed Setup)	7-104
7.26 Option /GA for Gas Measurement	7-104
8. SELF-DIAGNOSTIC AND TROUBLESHOOTING.....	8-1
8.1 Error descriptions and countermeasure	8-1
8.2 Reading Event + Error History (Diag/Service, Self test/Status)	8-3
8.3 Self test (Diag/Service).....	8-3
8.4 Signal- and I/O-Test (Diag/Service).....	8-3
8.5 Output trim	8-4
8.6 Detector cleaning.....	8-4
8.7 Troubleshooting.....	8-5
8.7.1 No indication.....	8-5
8.7.2 No key-setting possible	8-6
8.7.3 No HART communication	8-6
8.7.4 Unstable zero	8-7
8.7.5 Disagreement of indication with actual flow rate	8-8
8.7.6 Disagreement of indication with actual density.....	8-9
8.7.7 Disagreement of indication with actual temperature	8-10
8.7.8 Discrepancy of output signals to the assigned measurand.....	8-11
8.7.9 Setting "Burn-out" mode	8-12
8.8 Detection of metering tube failure.....	8-13
8.9 Customer Maintenance Part List	8-14

9. EXPLOSION PROTECTED TYPE INSTRUMENTS	9-1
9.1 ATEX	9-1
9.1.1 Technical Data	9-1
9.1.2 Installation	9-4
9.1.3 Operation	9-7
9.1.4 Maintenance and repair	9-7
9.1.5 Ex-relevant marking on name plates (refer to chapter 3.11)	9-7
9.2 FM (USA + Canada)	9-9
9.2.1 Technical Data	9-9
9.2.2 Installation	9-10
9.2.3 General warnings	9-12
9.2.4 Ex-relevant marking on name plates (refer to chapter 3.11)	9-13
9.2.5 Control drawings	9-14
9.3 IECEX	9-19
9.3.1 Technical Data	9-19
9.3.2 Installation	9-22
9.3.3 Operation	9-24
9.3.4 Maintenance and repair	9-24
9.3.5 Ex-relevant marking on name plates (refer to chapter 3.11)	9-25
9.4 INMETRO (Brazil)	9-26
9.5 Gost approval	9-26
10. PED (PRESSURE EQUIPMENT DIRECTIVE)	10-1
11. Technical Data	11-1
11.1 Specifications	11-1
11.2 Dimensions	11-8
11.3 Model, Suffix and Option Codes	11-15
APPENDIX 1. SOFTWARE CHANGE HISTORY	A1-1

APPENDIX 2. Safety Instrumented Systems Installation.....	A2-1
A2.1 Scope and Purpose	A2-1
A2.2 Using Rotamass 3 for a SIS Application.....	A2-1
A2.2.1 Safety Function	A2-1
A2.2.2 Safety Accuracy	A2-2
A2.2.3 Diagnostic Response Time	A2-2
A2.2.4 Setup	A2-2
A2.2.5 Proof Testing.....	A2-2
A2.2.6 Repair and Replacement.....	A2-3
A2.2.7 Startup Time	A2-3
A2.2.8 Firmware Update	A2-3
A2.2.9 Reliability Data	A2-3
A2.2.10 Lifetime Limits.....	A2-3
A2.2.11 Required Parameter Settings	A2-3
A2.2.12 Environmental Limits	A2-4
A2.2.13 Application Limits	A2-4
A2.3 Definitions and Abbreviations	A2-4
A2.3.1 Definitions.....	A2-4
A2.3.2 Abbreviations	A2-4

1. INTRODUCTION

This instrument has been adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.



NOTE

This manual describes the hardware and software configurations of the ROTAMASS Coriolis Massflowmeter.

Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Please note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- The following safety symbol marks are used in this user's manual and instrument.



WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.



CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.



IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.



NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

1. INTRODUCTION

- ⊕ Protective grounding terminal
- ⊥ Functional grounding terminal
(This terminal should not be used as a protective grounding terminal.)
- ~ Alternating current
- Direct current

1.1 Using the Coriolis Flowmeter Safely



WARNING

(1) Installation

- Installation of the Coriolis flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The Coriolis flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the Coriolis flowmeter. When moving the Coriolis flowmeter, always use a trolley and have at least two people carry it.
- When the Coriolis flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the line for maintenance and so forth.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring

- The wiring of the Coriolis flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The protective grounding must be connected securely at the terminal with the ⊕ mark to avoid danger to personnel.

(3) Operation

- Do not open the cover until the power has been off for at least 10 minutes. Only expert engineer or skilled personnel are permitted to open the cover.

(4) Maintenance

- Maintenance on the Coriolis flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) European Pressure Equipment Directive (PED)

- When using the instrument as a PED-compliant product, be sure to read Chapter 10 before use.

(6) Hazardous Duty Type Instruments

- For explosion proof type instruments the description in chapter 9 "EXPLOSION PROTECTED TYPE INSTRUMENT" has priority to the other descriptions in this instruction manual.
- All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you should contact your nearest Yokogawa office or representative.
- Only trained personal should install and maintain instruments in hazardous areas.
- The protective grounding terminal ⊕ must be connected to a suitable IS grounding system.
- Avoid mechanical generated sparks while working on the equipment and peripheral devices in hazardous areas.

1.2 Warranty

- The warranty terms of this instrument that are guaranteed are described in the quotation. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Please contact our sales office if this instrument requires repair.
- If the instrument is faulty, contact us with complete details about the problem and the length of time it has been faulty, and state the model and serial number. We would appreciate the inclusion of drawings or additional information.
- The results of our examination will determine whether the meter will be repaired free of charge or on an at-cost basis.

The guarantee will not apply in the following cases:

- Damage due to negligence or insufficient maintenance on the part of the customer.
- Problems or damage resulting from handling, operation or storage that violates the intended use and specifications.
- Problems that result from using or performing maintenance on the instrument in a location that does not comply with the installation location specified by Yokogawa.
- Problems or damage resulting from repairs or modifications not performed by Yokogawa or someone authorized by Yokogawa.
- Problems or damage resulting from inappropriate installation after delivery.
- Problems or damage resulting from disasters such as fires, earthquakes, storms, floods, or lightning strikes and external causes.

1.3 Instruction according EMC

The ROTAMASS Coriolis flowmeter is conform to the European EMC Guideline and fulfills the following standards:

EN 61326-1: 2006;

EN 61326-2-3: 2006;

EN 61000-3-2: 2006;

EN 61000-3-3: 1995+A1+A2

ROTAMASS is a class A product and should be used and installed properly according to the EMC Class A requirements

Restriction on Use of Radio Transceiver :



IMPORTANT

Although the products has been designed to resist high frequency electrical noise, if a radio transceiver is used near the flowmeter or its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the flowmeter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

Installation



CAUTION

The function ground terminal or the PE- terminal have to be connected to protective ground to ensure electro-magnetic interference protection.

To ensure the EMC specifications the following measures must be carried out :

1. Put the power cables through the ferrite core clamp before connecting to the terminals as shown in chapter ' Installation ' (Power supply wiring).
2. Put the I/O- cables through the ferrite core clamp before connecting to the terminals as shown in chapter ' Installation ' (Power supply wiring).
3. Connect protective ground conductor of power supply to PE- terminal in the terminal box (see chapter ' Installation ' (Power supply wiring).
4. In case of Explosion proof type instrument, further requirements are described in chapter 9 "EXPLOSION PROTECTED TYPE INSTRUMENTS". The description in this chapter is prior to other descriptions in this instruction manual.

1.4 ATEX Documentation

This is only applicable to the countries in European Union.

GB	All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.	SK	Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.
DK	Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.	CZ	Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.
I	Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.	LT	Visos gaminių ATEX Ex kategorijos Eksploatavimo instrukcijos teikiama anglų, vokiečių ir prancūzų kalbomis. Norėdami gauti prietaisų Ex dokumentaciją kitomis kalbomis susisiekit su artimiausiu bendrovės "Yokogawa" biuru arba atstovu.
E	Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.	LV	Visas ATEX Ex kategorijas izstrādājumu Lietošanas instrukcijas tiek piegādātas angļu, vācu un franču valodās. Ja vēlaties saņemt Ex ierīšu dokumentāciju citā valodā, Jums ir jāsazinās ar firmas Jokogava (Yokogawa) tuvāko ofisu vai pārstāvi.
NL	Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.	EST	Kõik ATEX Ex toodete kasutamishendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.
SF	Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöohjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellänne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.	PL	Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym języku, prosimy o kontakt z najbliższym biurem Yokogawy.
P	Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.	SLO	Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angleščini, nemščini ter francoščini. Če so Ex sorodna navodila potrebna v vašem tujejnem jeziku, kontaktirajte vaš najbližji Yokogawa office ili predstavnika.
F	Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.	H	Az ATEX Ex műszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kéri az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviselőt.
D	Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.	BG	Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.
S	Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.	RO	Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.
GR	Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.	M	Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Germaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentant jew uffċju ta' Yokogawa.

1.5 Disposal, Cleaning and Return

For safe use



WARNING

If the process fluid is harmful to personnel, handle the instrument carefully even after it has been removed from the process line for maintenance or other purposes. Exercise extreme care to prevent the fluid from coming into contact with human skin and to avoid inhaling any residual gas. Before sending it to the Seller for examination and/or repair please clean the instrument thoroughly and make sure, that no harmful chemicals are in or at the meter. If the instrument contains unknown fluids the Seller will send it back to the Purchaser for cleaning on their cost.



WARNING

ROTAMASS might be heavy instruments. Please give attention to prevent that persons are not injured by carrying or installing. It is preferable when carrying the instrument to use a cart and be done by two or more persons. When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.

Warranty

The warranty of the instruments shall cover the period noted on the quotation presented to the purchaser at the time of purchase. The Seller shall repair the instrument free of charge when the failure occurred during the warranty period.

All inquiries on instrument failure should be directed to the Seller's sales representative from whom you purchased the instrument or your nearest sales office of the Seller.

Should the instrument fail, contact the Seller, specifying the model and instrument number of the product in question. Be specific in describing details on the failure and the process in which

the failure occurred. It will be helpful if schematic diagrams and/or records of data are attached to the failed instrument. Whether or not the failed instrument should be repaired free of charge shall be left solely to the discretion of the Seller as a result of an inspection by the Seller.

The Purchaser shall not be entitled to receive repair services from the Seller free of charge, even during the warranty period, if the malfunction or damage is due to improper and/or inadequate maintenance of the instrument in question by the Purchaser handling, use or storage of the instrument in question beyond the design and/or specifications requirements, use of the instrument in question in a location not conforming to the conditions specified in the Seller's General Specification or Instruction Manual retrofitting and/or repair by an other party than the Seller or a party to whom the Seller has entrusted repair services. improper relocation of the instrument in question after delivery reason of force measure such as fires, earthquakes, storms/ floods, thunder/lightning, or other reasons not attributable to the instrument in question.

For disposal and recycling please refer to your national regulations.

Please find following help. After remove of all products rests the instruments can be disassembled and the parts treated different.

Naming: R = recycling, D = disposal,
Sd = special disposal

Name of product	Body		Converter housing		Cover with window		Electronics
Rota-mass	SS	R	Al	R	Al + Glass	D	Sd

In case of return of flow meters to Yokogawa for testing or repair purposes please fill out one of the following forms and send it with the equipment to YOKOGAWA.

1. INTRODUCTION

Receiver : _____

Sender : _____

Delivery Note (for EU-Countries)

Date : _____

Ref. REPAIR for serial no. _____

We are sending following type of article
via forwarding agent : Yusen Air ; Raunheim/Frankfurt

Item	Article	Unit Price	Total Price
	Type (MS-Code) _____	€ _____	€ _____ (nominal value)
	Charges for airworthy packing and delivery FOB		€ _____
	Total value		€ _____
	Value for customs purpose only		€ _____ (current value)
	Gross weight . _____ kg		
	Net weight : _____ kg		
	Customs Tariff No. : _____		
	Country of origin : Federal Republic of Germany		

Delivery note 2-fold accompanis the goods

SPECIMEN Certificate

Company : _____
Department : _____
Telephone : _____

Address : _____
Name : _____
Fax : _____

The attached flowmeter :

Type : _____ Order- or Serial No. _____

has been operated with following liquids: _____

Because the liquid is ☐ water-endangering ☐ toxic ☐ caustic ☐ flammable
we have

☐ checked, that all cavities in the flowmeter are free from such substances

☐ flushed out and neutralised all cavities in the flowmeter

Please check applicable description

We confirm that there is no risk to man or enviroment through any residual liquid contains in this flowmeter.

Date : _____ Signature : _____

Company stamp:

Receiver : _____

Sender : _____

PROFORMA INVOICE (for Third-party-Countries)

Date : _____

Ref. REPAIR for serial no. _____

We are sending following type of article
via forwarding agent : Yusen Air ; Raunheim/Frankfurt

Item	Article	Unit Price	Total Price
	Type (MS-Code) _____	€ _____	€ _____ (nominal value)
	Charges for airworthy packing and delivery FOB		€ _____
	Total value		€ _____
	Value for customs purpose only		€ _____ (current value)
	Gross weight . _____ kg		
	Net weight : _____ kg		
	Customs Tariff No. : _____		
	Country of origin : Federal Republic of Germany		

Delivery note 2-fold accompanies the goods

SPECIMEN Certificate

Company : _____
Department : _____
Telephone : _____

Address : _____
Name : _____
Fax : _____

The attached flowmeter :

Type : _____ Order- or Serial No. _____

has been operated with following liquids: _____

Because the liquid is ☐ water-endangering ☐ toxic ☐ caustic ☐ flammable
we have

☐ checked, that all cavities in the flowmeter are free from such substances

☐ flushed out and neutralised all cavities in the flowmeter

Please check applicable description

We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date : _____ Signature : _____

Company stamp:

1.6 Confirmation of accessories

When you received the instrument, please check the following accessories.

RCCF31 remote type converter

- 1x ferrite cores for power line
- 1x ferrite core for I/O lines
- 1x band for fixing the ferrite cores on power line
- 1x 2-inch pipe mounting bracket set
 - 1x bracket
 - 1x U-bracket
 - 2x nuts
 - 2x washers
 - 4x bolts with hexagon socket
- 1x terminal wiring auxiliary tool
- 1x cable gland for wiring port detector signal
 - M20 cable gland (metal) (for RCCF31-xxxM...)
 - NPT 1/2" cable gland (metal) (for RCCF31-xxxA...)
- 2x cable gland for power supply and I/O signal wiring port
 - M20 cable gland (plastic) (for RCCF31-xxxM...)
 - NPT 1/2" (for RCCF31-xxxA...) cable glands for power supply and I/O signal wiring port are not attached.

Remote type detector RCCS3

- 1x cable gland for wiring port detector signal
 - 1x M20 cable gland (for RCCS3x-Mxxxxxx)
 - 1x NPT 1/2" cable gland + 1x adapter M20 to NPT (for RCCS3x-Axxxxxx)

Integral RCCT3

- 1x ferrite cores for power line
- 1x ferrite core for I/O lines
- 1x band for fixing the ferrite cores on power line
- 1x terminal wiring auxiliary tool
- 2x cable gland for power supply and I/O signal wiring port
 - M20 Cable gland (plastic) (for RCCT3x-xxxMxxxxxx)
 - 1x NPT 1/2" cable gland + 1x adapter M20 to NPT (for RCCS3x-Axxxxxx)

2. TRANSPORTATION AND STORAGE

Transport instructions

When transporting the instrument, you must observe the following safety instructions in order to avoid lethal injury, damage to the instrument and other material damage.

The steps involved in transport may only be carried out by qualified persons taking into account the safety instructions.

- Observe the transport instructions on the packaging.
- Observe the below mentioned storage conditions.
- Use only the original packaging.
- The packaging material must be disposed of in accordance with the regulations.
- The transport braces must not be removed until installation.
- Read the chapter "Safety instructions".
- To avoid any damages, unpack the flowmeter only at the installation site.
- Mechanical shocks are to be avoided.



WARNING

ROTAMASS is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

Storage conditions

Please note the following for storage purposes :

The detector and converter should be stored in its transport packaging.

Choose a storage place that meets the following requirements:

- Protection from rain and humidity
- Free of mechanical vibration and shocks
- Ambient temperature between -40°C to 55°C (RCCT3 / RCCF31 / RCCR31)
 -50°C to 80°C (RCCS3)
- Atmospheric humidity ranging from 0 to 100%. Operation above 95% for longer times is not recommended

Before storing a used flowmeter remove any fluid from the flowmeter line completely.

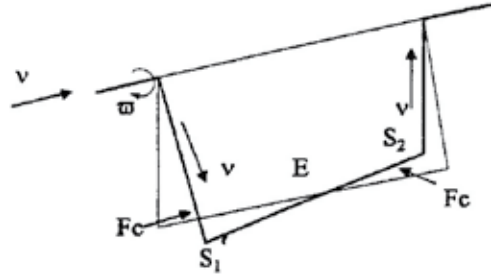
Properties of the instrument can change when stored outdoors.

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3. PRODUCT DESCRIPTION

3.1 The functional principle

The ROTAMASS instrument measures the mass flow with the help of the so-called Coriolis force. This force occurs, when the medium being measured is flowing at velocity v through a tube that is rotating around an axis perpendicular to the direction of flow at angular velocity ω .



When the medium moves away from the axis of rotation it must be accelerated to an increasingly high peripheral velocity. The force required for this is called Coriolis force, after its discoverer. The Coriolis force reduces the rotation. The opposite effect occurs, when the medium flows towards the axis of rotation. Then the Coriolis force amplifies the rotation.

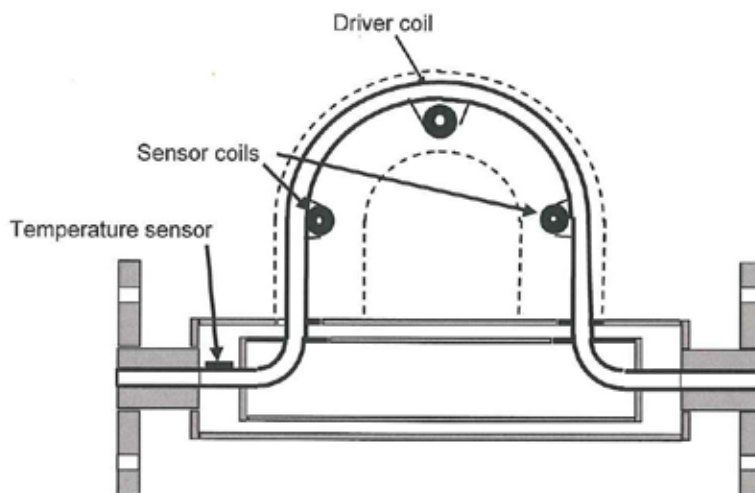
The formula for the Coriolis force is as follows:

$$\vec{F}_c = -2m(\vec{\omega} \times \vec{v})$$

The entire measurement tube is deformed slightly by the Coriolis forces, in the way shown. This deformation is registered by movement sensors at points S_1 and S_2 .

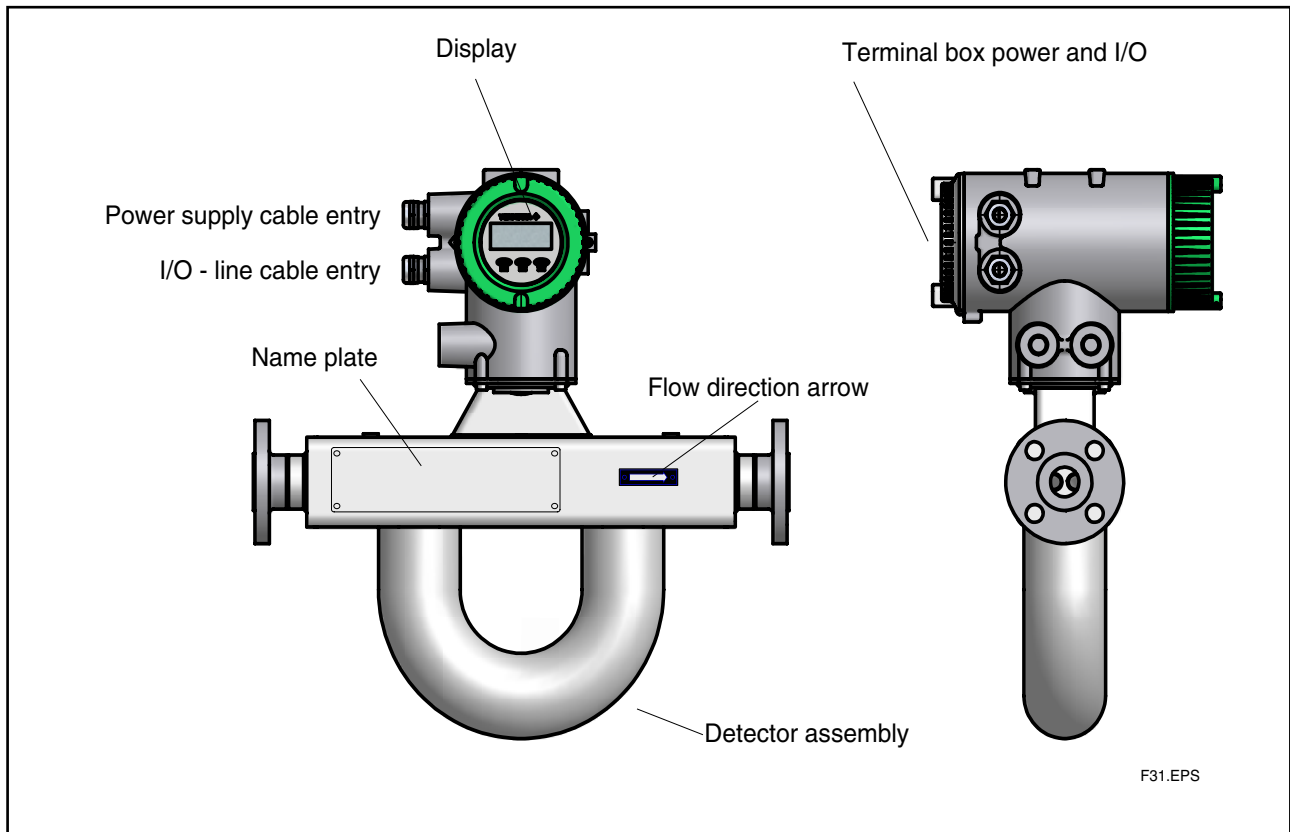
For practical exploitation of this physical principle, it is sufficient for the tube to perform sympathetic oscillations on a small section of a circular path. This is achieved by exciting the measurement tube at point **E** by means of an electromagnetic exciter.

The general construction of a Coriolis mass flowmeter looks as followed:



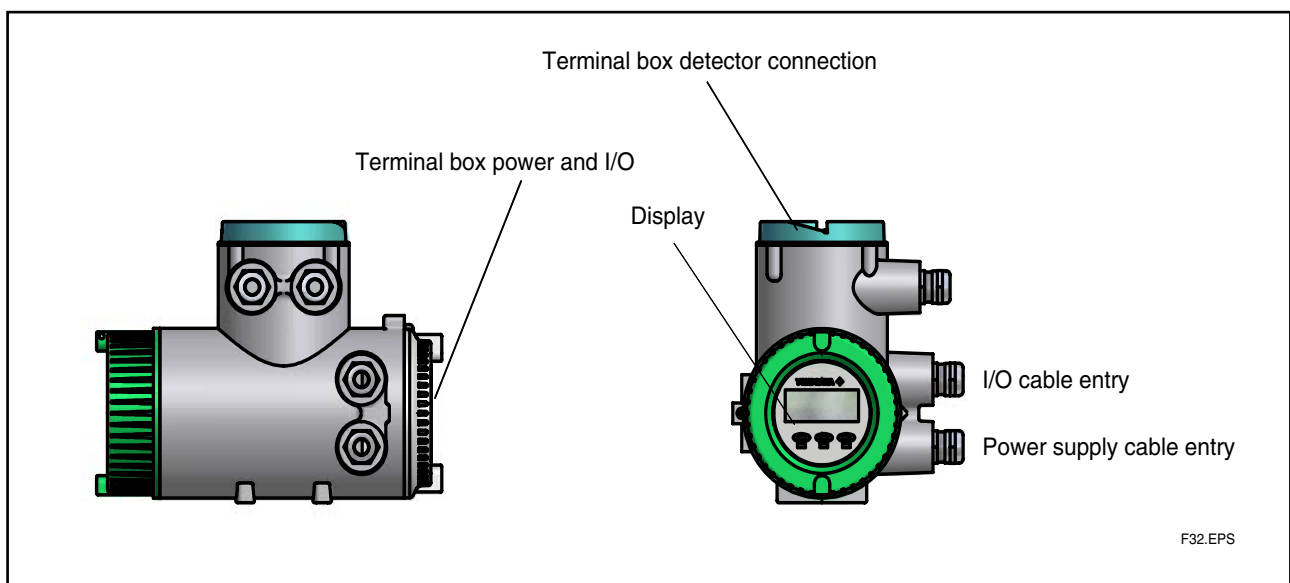
3.2 The Integral Type RCCT34 to 39/IR

The following drawing shows the general construction of the integral type ROTAMASS



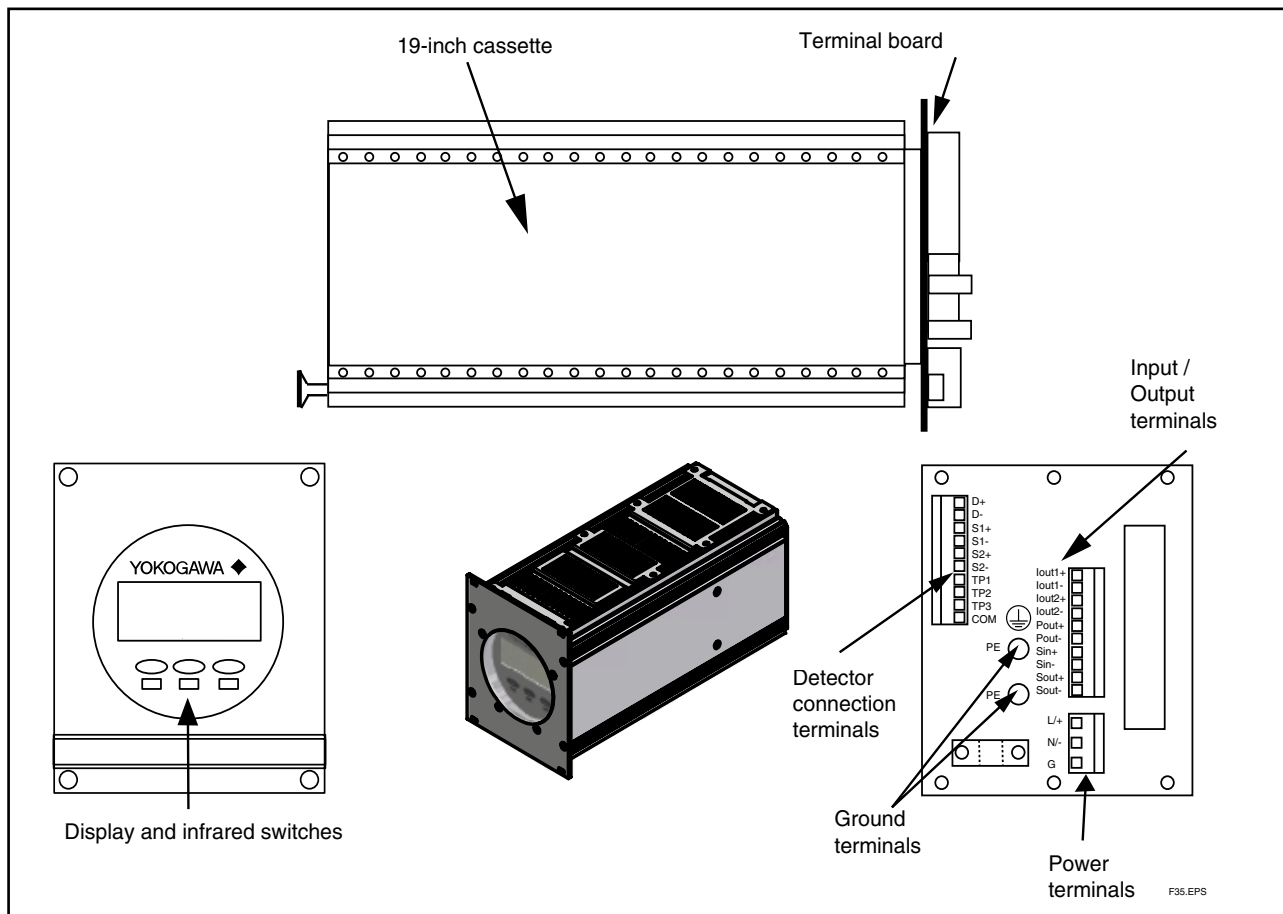
3.3 The Remote Field-Mount Converter RCCF31

The following drawing shows the general construction of the remote field-mount converter.



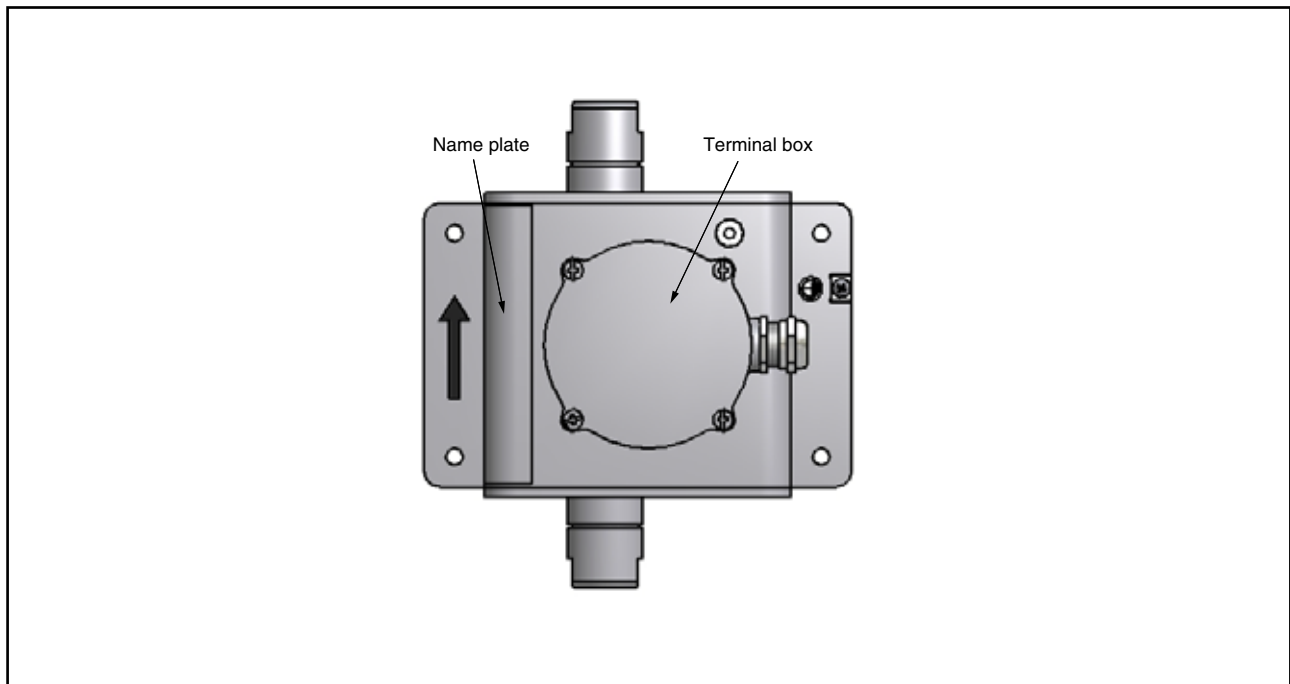
3.4 The Remote Rack-Mount Converter RCCR31

The following drawing shows the general construction of the remote rack-mount converter.



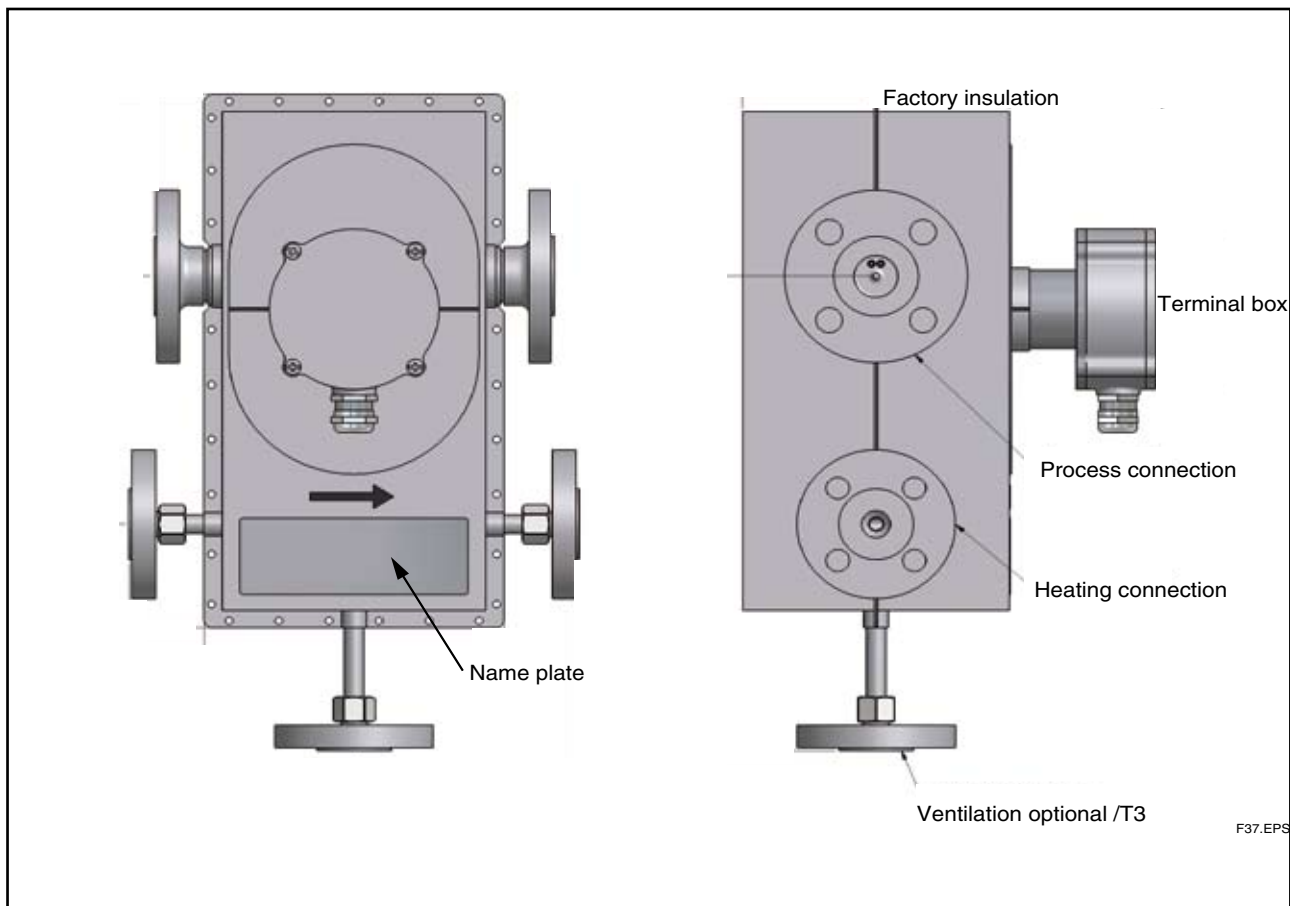
3.5 The Remote Detector RCCS30 to 33

The following drawing shows the general construction of the remote detector RCCS30 to 33.



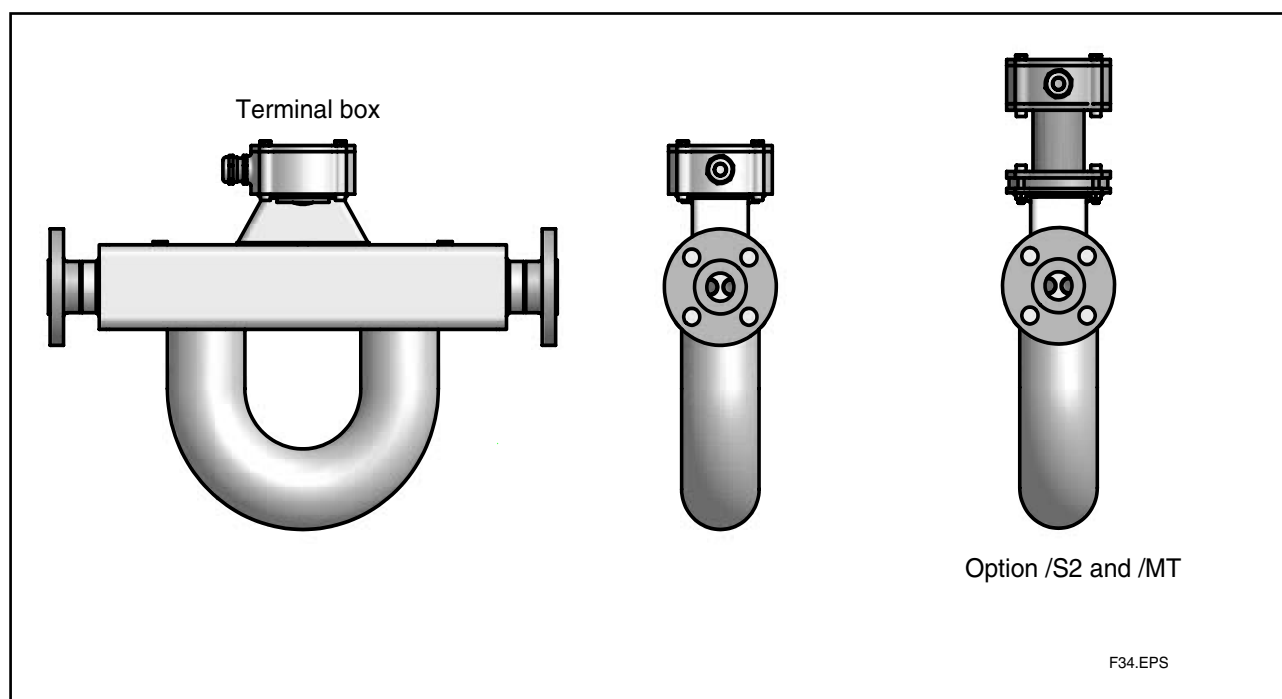
3.6 The Remote Detector RCCS30 to 33 /Tx

The following drawing shows the general construction of the remote detector RCCS30 to 33 /Tx.



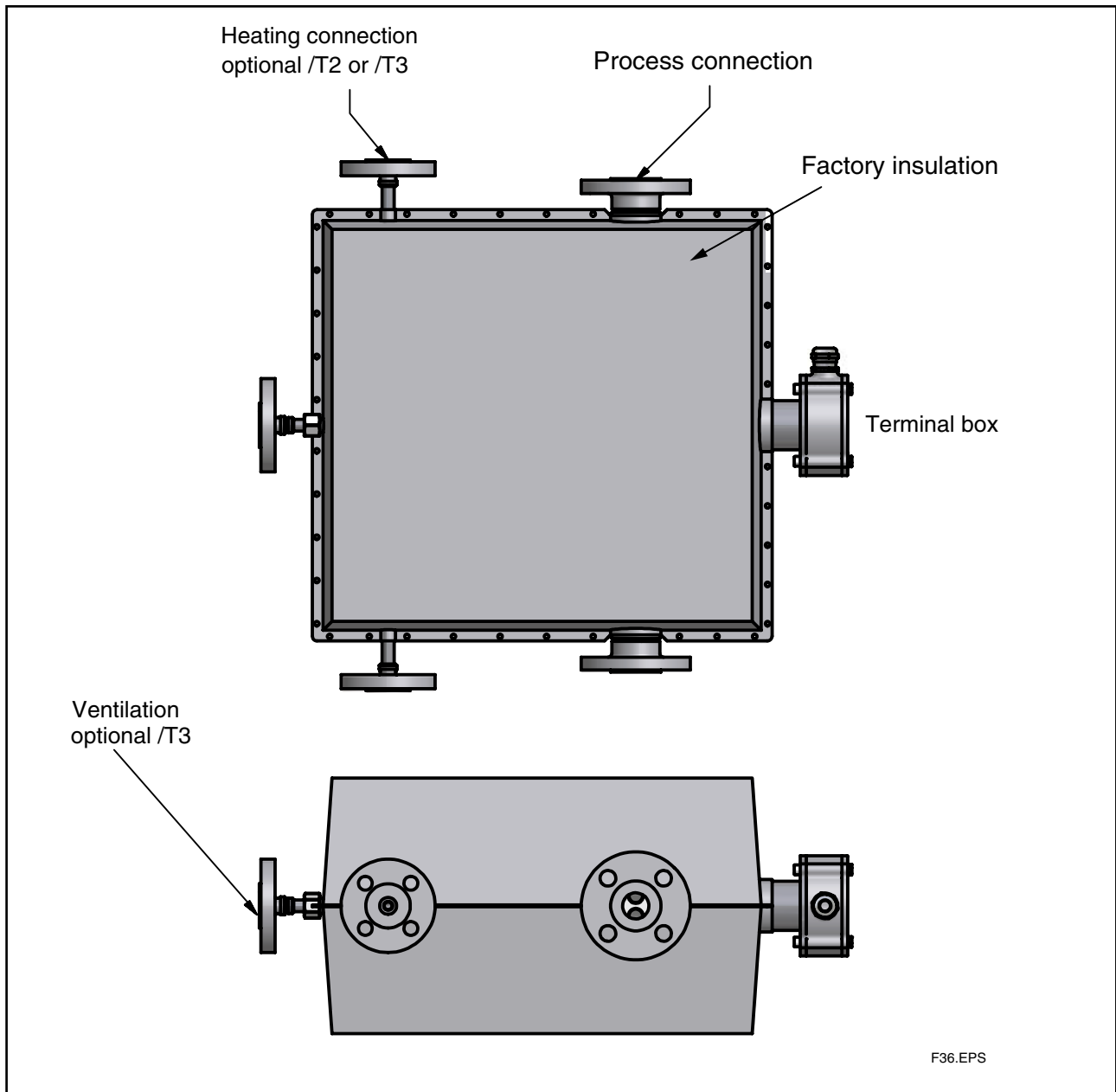
3.7 The Remote Detector RCCS34 to 39/IR

The following drawing shows the general construction of the remote detector RCCS34 to 39/IR.



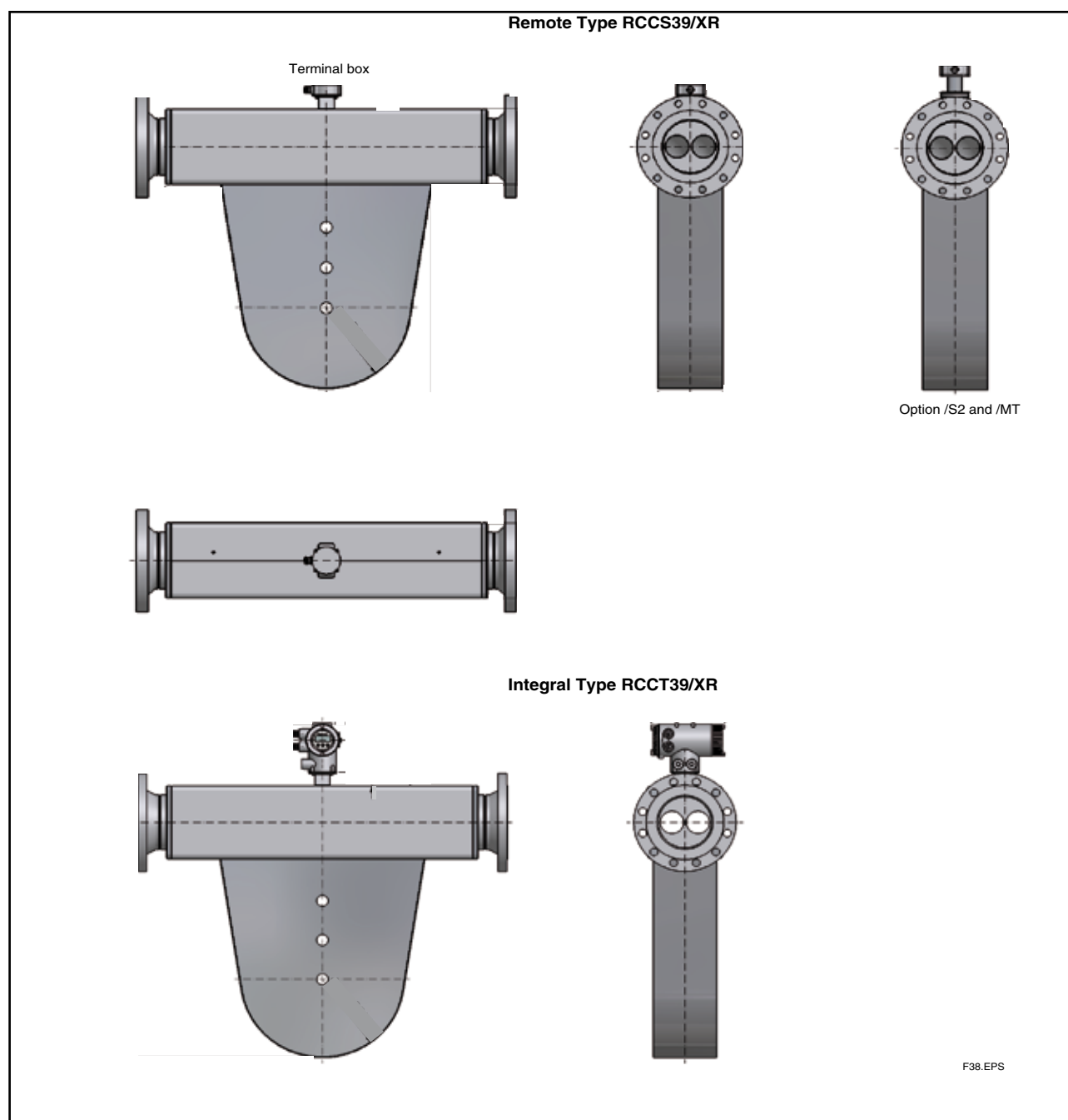
3.8 The Remote Detector RCCS34 to 39/IR /Tx

The following drawing shows the general construction of the remote detector RCCS34 to 39/IR /Tx.



3.9 The Remote and Integral Type RCCx39/XR

The following drawing shows the general construction of the RCCx39/XR.



3.10 Measurement system and applications

ROTAMASS measures the mass flow of fluids directly.

The measurement system uses the Coriolis principle and is suitable for a wide range of continuous flow measurement applications in all branches of process technology.

ROTAMASS has two components: the detector and the converter.

The detector measures the mass flow directly and converts it into electrical signals.

The converter evaluates the electrical signals and outputs the following values:

- mass flow, independent from media properties, such as density, temperature, viscosity
- fluid density
- fluid temperature

The values are displayed and output as electrical values for use by other systems.

The converter is operated by three infra-red keys and a 4- line display and is standard equipped with HART-communication protocol.

ROTAMASS is suitable for

- measuring liquids, liquids with solid content, multi-phase mixtures
- measuring gases (restricted by density and pressure loss)
- simultaneous measurement of mass flow, density, temperature, volume flow and cumulated mass and volume
- measuring of concentrations of liquid mixtures, solutions and suspensions
- connection to controllers and process control systems

ROTAMASS provides the following I/O-connections and can be configured for a wide variety of different measurement applications (controlling, checking, monitoring, metering, mixing, filling).

- 2 active analog outputs
- 2 passive pulse outputs / status outputs
- 1 status input

optional /AP:

- 1 active pulse output / status output

optional /NM:

- 1 pulse output / status output according EN 50227 (NAMUR)

optional /KF2 :

- 1 passive analog output Ex ia
- 1 passive pulse output / status output Ex ia

These capabilities make ROTAMASS ideal for the increasing demand of requirements for automation and the growing trend towards batch processes.

optional /FB see IM 01R04B05-00E-E :

- 1 Foundation Fieldbus communication line

optional /FB and /KF4 see IM 01R04B05-00E-E :

- 1 intrinsic safe Ex ia Foundation Fieldbus communication line

3.11 Name Plates

Name plate of Integral type RCCT3:

ROTAMASS MASSFLOW METER			
MODEL		METER FACTORS	
SERIAL-No.		SK20	
AMB. TEMP.		KD	
CURRENT OUTPUT		f120	
PULSE & STATUS OUTPUT			
MANUFACTURED			
PS		TS	
MATERIAL			
TAG.No.			

- 1 Model code
- 2 Serial number
- 3 Ambient temperature range
- 4 Current output range and load resistance range
- 5 Power supply range
- 6 Maximum supply voltage and maximum current for passive pulse- and status- output
- 7 Calibration constants of detector (see also on calibration certificate)
- 8 Number of notified body according ATEX (only for ATEX certified flowmeters)
- 9 Number of notified body according PED (only for units with process connections more than DN25)
- 10 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
- 11 PS = maximum permissible pressure
- 12 TS = maximum permissible process temperature
- 13 Material of metering tubes
- 14 Year of manufacturing
- 15 Customer specified tag number if option /BG was ordered

Name plate of Remote Converter RCCF31 / RCCR31:

ROTAMASS MASSFLOW CONVERTER			
MODEL			
SERIAL-No.		SUPPLY	
MANUFACTURED	AMB. TEMP.	CURRENT OUTPUT	
		PULSE OUTPUT	
		STATUS OUTPUT	
TAG.No.			

- 1 Model code
- 2 Serial number
- 3 Year of manufacturing
- 4 Ambient temperature range
- 5 Power supply range
- 6 Current output range and load resistance range
- 7 Maximum supply voltage and maximum current for passive pulse output
- 8 Maximum supply voltage and maximum current for passive status output
- 9 Number of notified body according ATEX (only for ATEX certified flowmeters)
- 10 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
- 11 Customer specified tag number if option /BG was ordered

3. Product description

Name plate of Remote Detector RCCS3:

ROTAMASS MASSFLOW METER	
MODEL	METER FACTORS
SERIAL-No.	SK 20
	KD
	FI 20
	MANUFACTURED
	PS
	TS
	MATERIAL
	TAG.No.

1 Model code
2 Serial number
3 Calibration constants of detector (see also on calibration certificate)
4 Number of notified body according ATEX (only for ATEX certified flowmeters)
5 Number of notified body according PED (only for units with process connections greater than DN25)
6 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
7 PS = maximum permissible pressure
8 TS = maximum permissible process temperature
9 Material of metering tubes
10 Year of manufacturing
11 Customer specified tag number if option /BG was ordered

- 1 Model code
- 2 Serial number
- 3 Calibration constants of detector (see also on calibration certificate)
- 4 Number of notified body according ATEX (only for ATEX certified flowmeters)
- 5 Number of notified body according PED (only for units with process connections greater than DN25)
- 6 Area for Ex- relevant marking (see chapter 9). The CE-mark is not present for FM-approved units.
- 7 PS = maximum permissible pressure
- 8 TS = maximum permissible process temperature
- 9 Material of metering tubes
- 10 Year of manufacturing
- 11 Customer specified tag number if option /BG was ordered

Name plate of RCCT3 and RCCS3 with option /DS (Dual Seal approval):

In general the name plates of these units are the same as shown above.

The difference is as followed:

- PS is named as "Working pressure range"
- TS is named as "Process temperature range"
- "Dual Seal" is additionally stated on the name plate

4. INSTALLATION

4.1 General



WARNING

This instrument must be installed by an expert engineer or skilled personal. The procedures described in this chapter are not permitted for operators.

For the installation of explosion protected instruments see chapter 9 „Explosion protected type instruments“.

If the detector is not insulated, the surface of detector may be very hot according to the process temperature.



IMPORTANT

- Keep protection sheet on the flanges attached until the flowmeter is installed to piping.
- Don't open the terminal box until the wiring procedure. Leaving the box opened can result in insulation deterioration.
- A newly installed piping-line often contains foreign matters (such as welding scrap and wood chips). Remove them by flushing the piping before installing the flowmeter. This will help to prevent not only damaging the flowmeter, but making erroneous signal generated by foreign matters.
- For RCCT3 or RCCF31 at ambient temperature above 50°C a sunshade is recommended. This is particularly important in countries with high ambient temperatures.

About the site

To stabilize the instrument, please consider the following items where to place the instrument for your long-term use.

- Ambient Temperature

Please avoid installing in a place which has a large temperature gradient and variation as possible. And if the meter is subjected to radiant heat from plant, please use heat insulation measure or please set up so that is well ventilated.

- Atmospheric conditions

Please avoid to place in a corrosive atmosphere as possible. When used in corrosive atmosphere, allow better ventilation.

- Shock and vibration

Please install in a place without shock and vibration as possible.

- Explosion-proof equipment installations

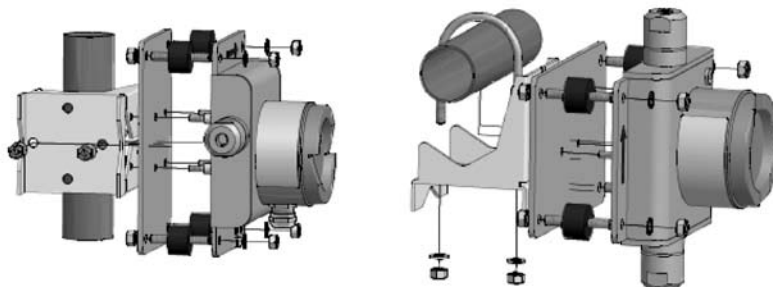
If the product is installed in hazardous areas please notice the installation hints in chapter 9.

Sequence of installation:

- Mounting of detector RCCS30 to 33 on a 2-inch pipe if option /PD was ordered (see chapter 4.2)
- Piping of the detector or integral flowmeter in the line (see chapter 4.3)
- Customer insulation of detector if necessary (see chapter 4.4)
- Mounting of converter RCCF31 on a 2-inch pipe (see chapter 4.5)
- Mounting of converter RCCR31 in a subrack (see chapter 4.6)
- Alteration of converter display of converter RCCF31 if necessary (see chapter 4.7)
- Wiring of converter (see chapter 4.8)
- After installation an autozero according chapter 5.6 must be executed. When carrying out the zero-adjustment, the measuring tube should be filled with the liquid at “no flow”. It is therefore recommended to have shut-off valves at appropriate points of the upstream (vertical installation) and downstream (horizontal installation) of the flowmeter.

4.2 Mounting of detector RCCS30 to 33 option /PD

The detector RCCS30 to 33 can be mounted on a 2-inch pipe (option /PD) with a bracket and U-bolt assy.



4.3 Piping



IMPORTANT

When the following notes are not observed, flow measurements may not be correct and can damage the instrument. Please make correct piping design in accordance with the present guidelines.



IMPORTANT

Please be careful to install the flowmeter not too close to motors, transformers, inverters and other power source, induction failure may occur.

1. The upstream and downstream piping length has no influence on the functioning of the instrument.
2. Piping requirements for proper operation :
 - A Coriolis mass flowmeter can be installed vertically, horizontally or at any angle from the horizontal position.
 - However, the piping must be installed to ensure that the measuring tube is always filled with liquid.
 - The position of installation of the detector is arbitrary. A vertical mounting is recommended however.

Vertical installation (recommended):

Makes pipe easier to empty (in case of maintenance, start-up, product change). Helps gas bubbles to escape.

Only one shut-off valve is required to ensure “no flow” for setting Autozero.

Horizontal installation :

For liquids: Measuring tube downwards so that no gas can collect if “no flow”.

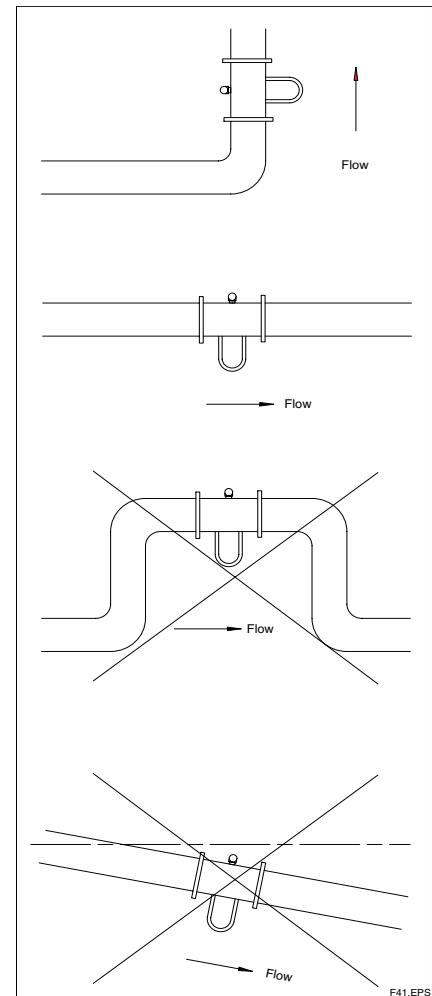
For gasses: Measuring tube upwards so that no liquid can collect if “no flow”.

Installation at highest point of a piping system:

Avoid it, as this can lead to collection of gas bubbles.

Installation with pressure below 1 bar abs:

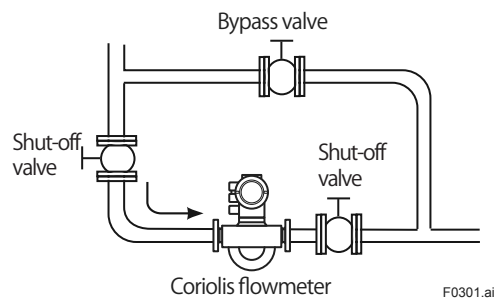
Avoid it, as suction can draw air into the measuring tube, leading to incorrect measurements. Free outlets to containers or vessels can generate low pressure by earth gravity acceleration.



- Do not stress the detector mechanically. Fix the pipe not on both ends of the detector but only at one side. Let the other side run free for minimum mechanical stress on the detector.
- Please use the standard reducers if the piping's cross-section differs at the inlet or outlet point of the flowmeter.

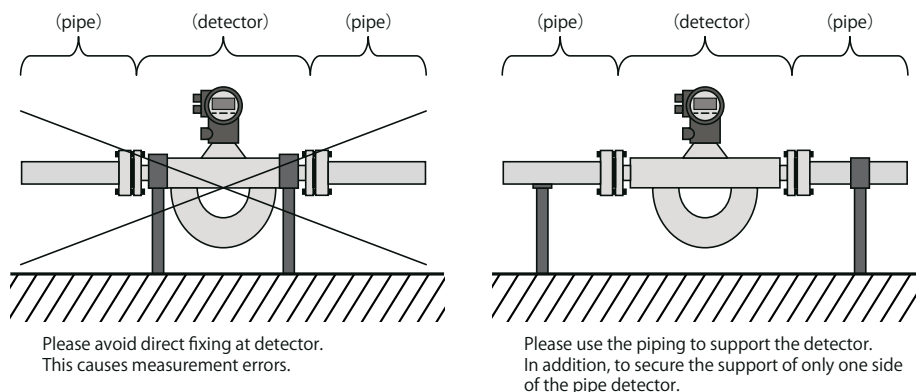
Use shut-off valve and bypass line

To facilitate zero adjustment and maintenance, providing a bypass line is recommended.

**Supporting the Coriolis flowmeter****WARNING**

- Please prevent the detector from pipeline stretching, vibration or shock.
- Please prevent the detector from direct fixing. (See figure below.)
- Please fix the pipe at first and support the detector with piping. (See figure below.)
- Please fix only one side of the detector instead of both sides so as to minimize mechanical stress to the detector.

4. INSTALLATION



IMPORTANT

When density measurement is used and the instrument is set up horizontally, you will need to set a predetermined correction factor into the converter. Please see chapter 7.7.

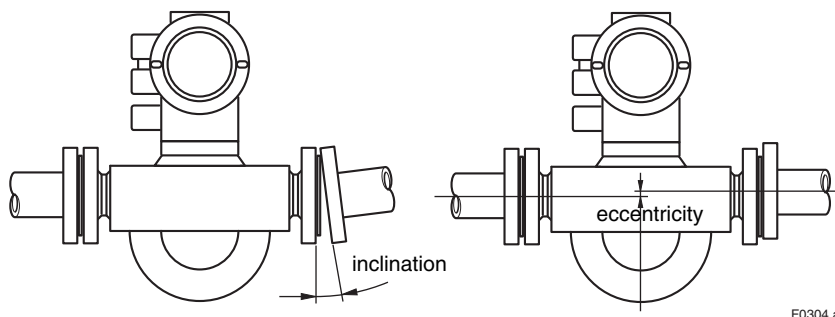
Check the adjacent pipe



WARNING

Eccentricity and inclination are dangerous and may cause leakage in the piping. This may cause damage to the pipe flanges.

If the dimensions are not in tolerance or you have incline or eccentric pipes, please correct before installing detectors.



If a new pipeline is provided, it may have other foreign materials such as wood chips and welding trash. Before installing, please remove them by flushing.

Mounting of integral and remote type detector



IMPORTANT

Please prepare your flange bolts and nuts. Please provide a gasket in the piping. However, if the gasket diameter is too large or too small.

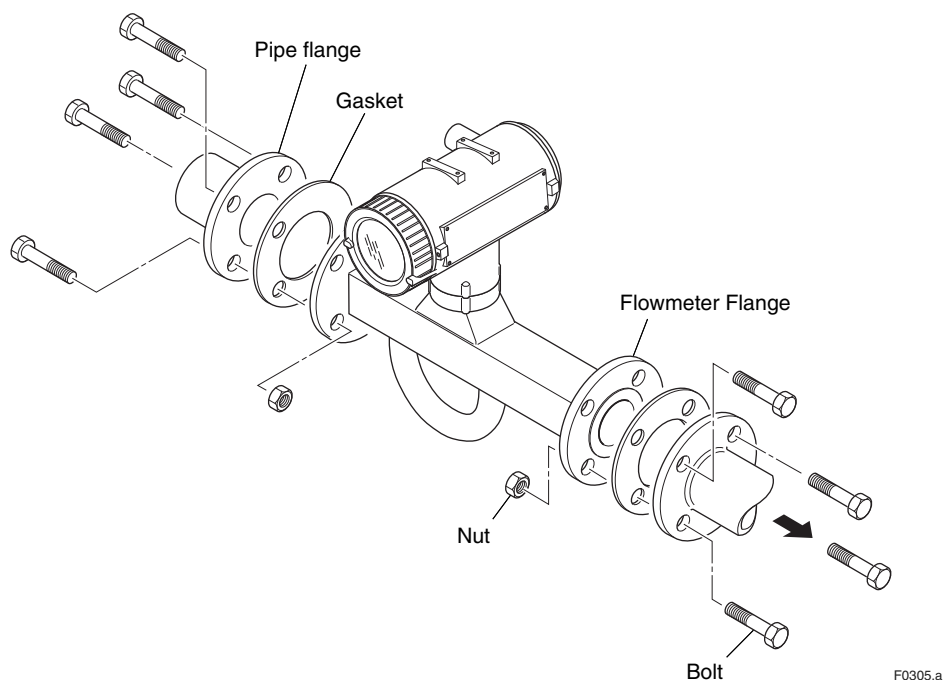
(1) Mounting direction

Please note the flow direction according the arrow on the instrument. If flow is opposite to the direction of the arrow change parameter "Flow Direction" (see chapter 7.17).

(2) Mounting Flange

Install piping by using bolts, nuts and gaskets.

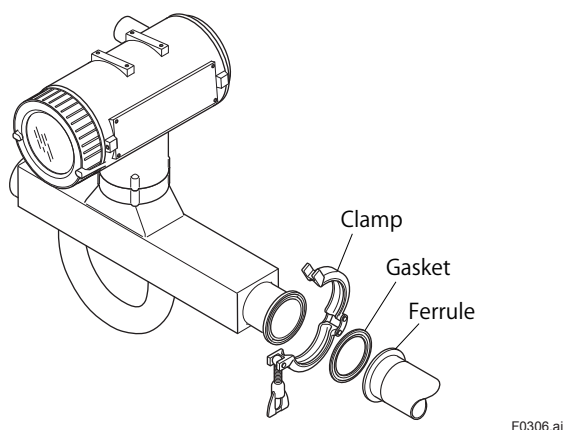
Bolts, nuts and gaskets are not included. Please prepare those according the flanges.



(3) Mounting Clamp

Clamp and gasket must be mounted to fit into the groove of the ferrules of the pipe, fitted to cover the taper portion of the ferrule to the Coriolis flowmeter.

The ferrules, clamps, gaskets are not included and must be provided on site.



Gas flow measurement



CAUTION

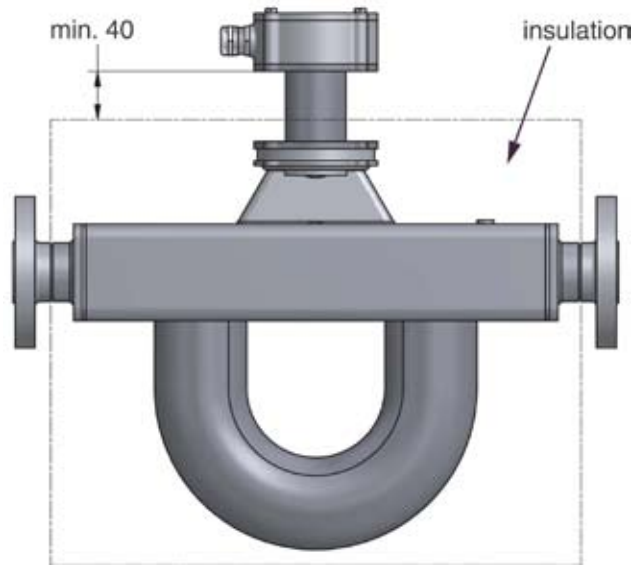
A stable zero is mandatory for a good mass flow measurement. Mechanical installation stress and flow noise influence zero stability. Action has to be taken to avoid any generation of sound.

Recommendations:

- Support the weight of the detector by soft coupling (silicon or other kind of rubber support).
- Do not bend or stress the detector via the adjacent pipe. This is achieved by supporting the pipe 10D or more away from the detector.
- Pipe reduction or extension should be avoided directly before or after the meter.
- Avoid any control valves or orifices or any other sound generator near the detector.

4.4 Customer insulation

Customer insulation is only possible for remote detector RCCS3x with option /S2 (terminal box on distance). The upper line of the insulation must be minimum 40 mm below the terminal box.

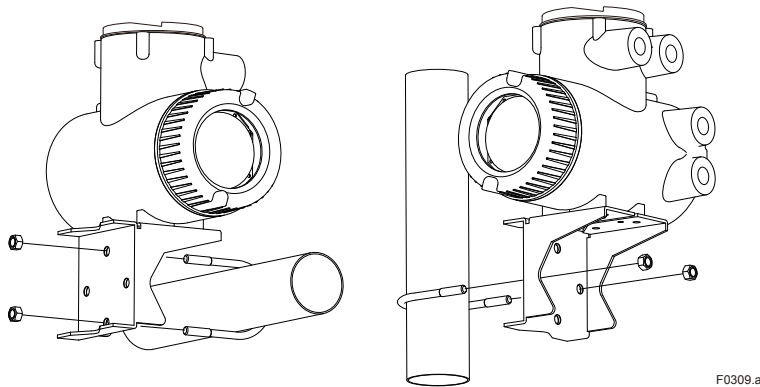


IMPORTANT

For explosion proof types see tables "Temperature classification" in chapter 9.

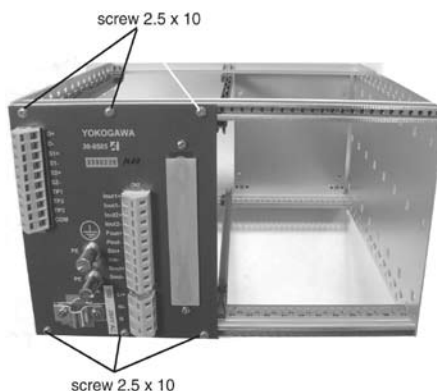
4.5 Mounting of converter RCCF31 to 2-inch pipe

The field-mount converter RCCF31 can be mounted on a 2-inch pipe. Therefore use the delivered bracket and U-bolt assy.



4.6 Mounting of converter RCCR31 in a subrack

If the remote rack mount converter RCCR31 was not ordered with option /SR1 or /SR2, the customer has to mount it to an own 19'' subrack. The terminal board must be fixed by 6 screws (M2.5x10) to the rear side of the subrack.



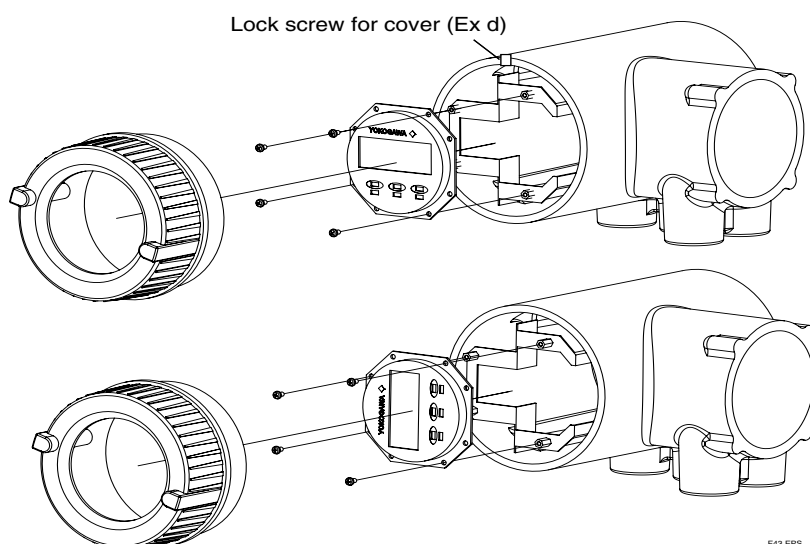
The RCCR31 rack cassette must be inserted into the subrack.



4.7 Alteration of display (RCCT3 / RCCF31)

LCD display can be turned its direction with respect to piping configurations.

Removing four screws, adjusting display's orientation and fixing the screws tightly again as shown in figure below.



IMPORTANT

Fix the lock screw for use in hazardous area. After modification the user must ensure that the cover is screwed down tightly to maintain the IP rating of the housing, failure to do so may allow moisture ingress and failure of electronic components.

4.8 Wiring

4.8.1 General items

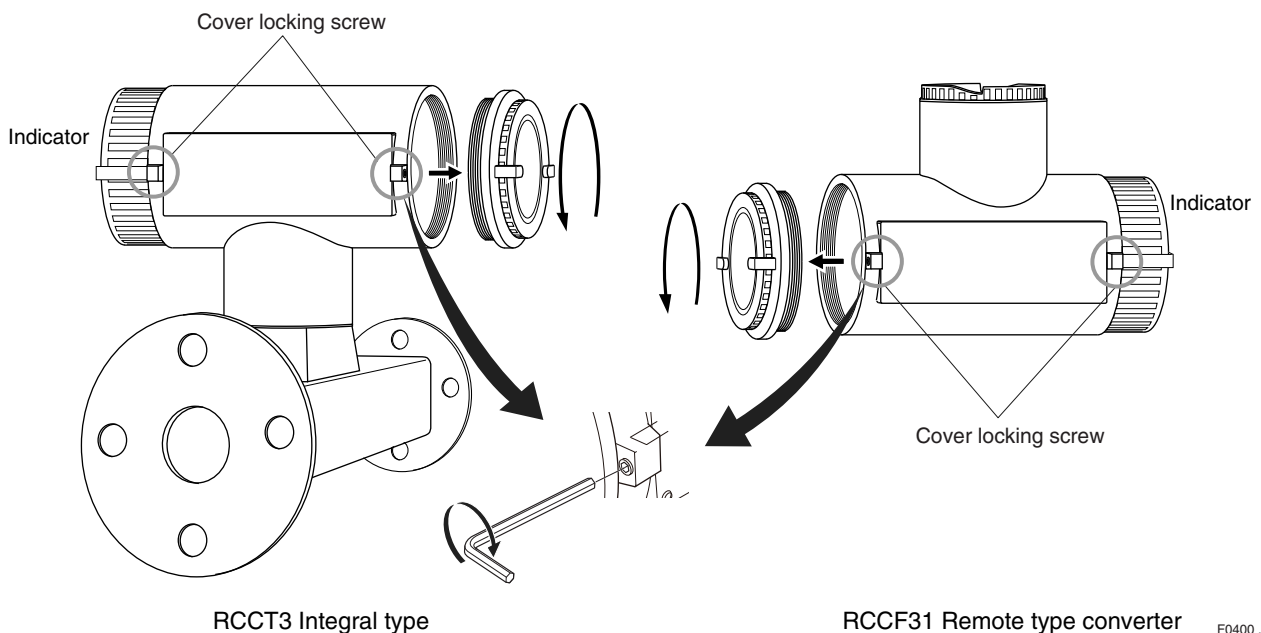
Notes concerning the wiring

When wiring, please observe the following precautions.



WARNING

- In order to prevent damage from condensation ensure isolation of the terminal box of the Coriolis flowmeter.
- Conduit wiring is recommended. Please use wiring conduit thick steel or flexible. In order to prevent rainwater from flowing or remain into the wiring pipe, please keep the watertight using a seal tape.
- Before opening the terminal box, be sure to turn off the power.
- Please fully tighten the terminal box cover.
- When removing the cover, please unlock the locking screw clockwise. (See figure below).
- After mounting the cover, please lock the cover by turning the locking screw counterclockwise. (See figure below).
- For explosion proof wiring please see chapter 9.

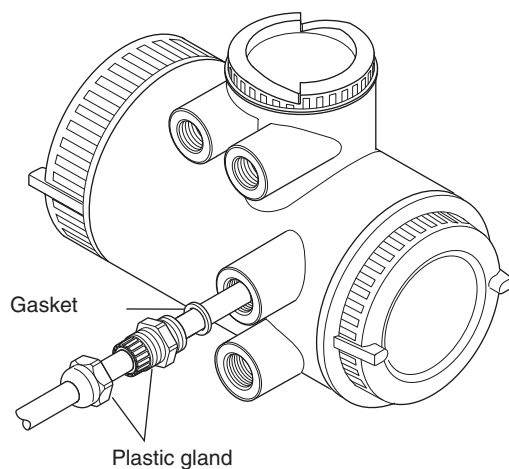


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Wiring port handling

(1) When waterproof property is unnecessary

For meters with NPT 1/2" threads the wiring port is sealed with a cap (not water-proof) that must be removed before wiring. For the unused wiring port, please prepare plug by the customer. For explosion proof, please refer to Chapter 9.



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(2) When waterproof property is necessary (Wiring using waterproof glands)

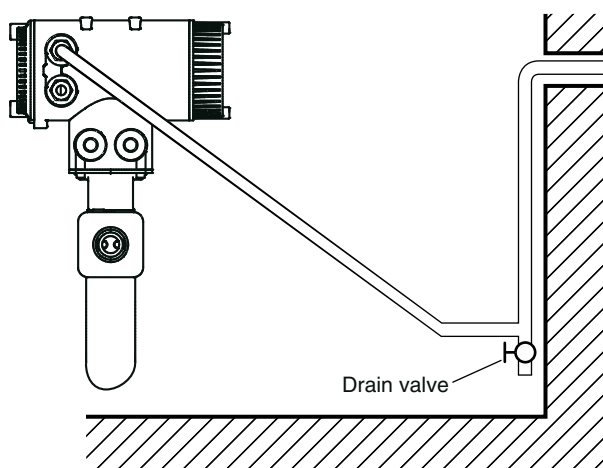


IMPORTANT

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

(3) Conduit Wiring

When wiring the conduits, utilize the waterproof gland to prevent water from flowing into wiring connection port. Place the conduit pipe on an angle as shown in Figure below. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.



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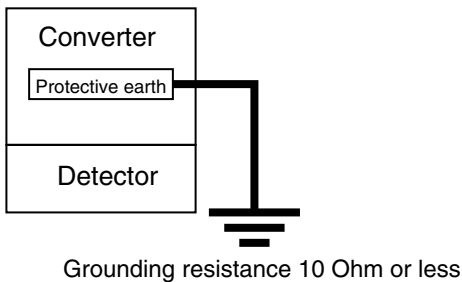
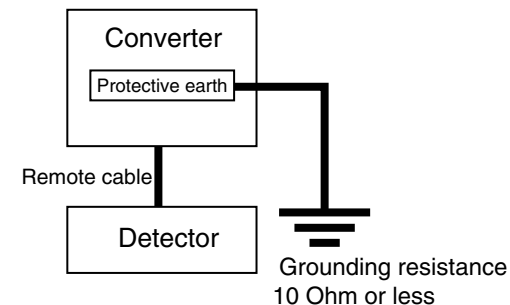
4. INSTALLATION

4.8.2 Ground (earth) connections

**IMPORTANT**

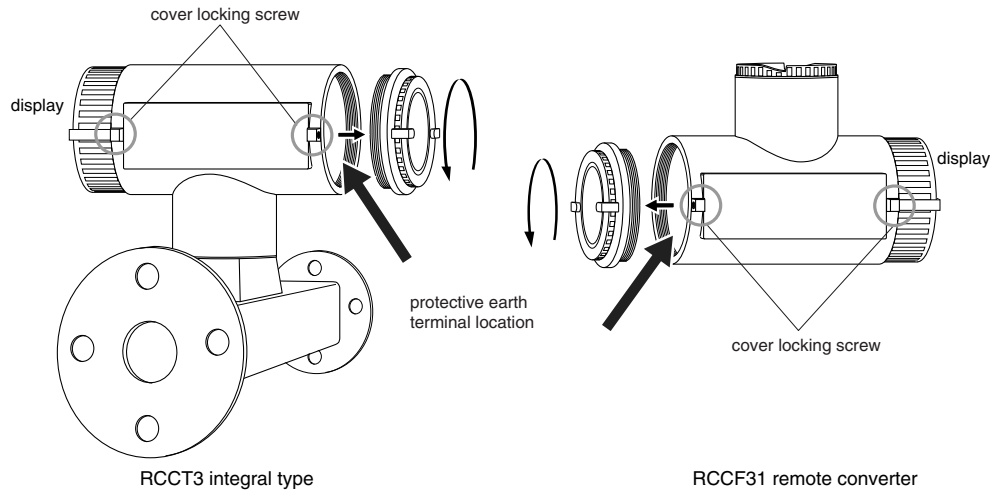
Grounding resistance of 10 Ω or less is necessary. For explosion proof type follow the domestic electrical requirements as regulated in each country.

The following table shows the grounding:

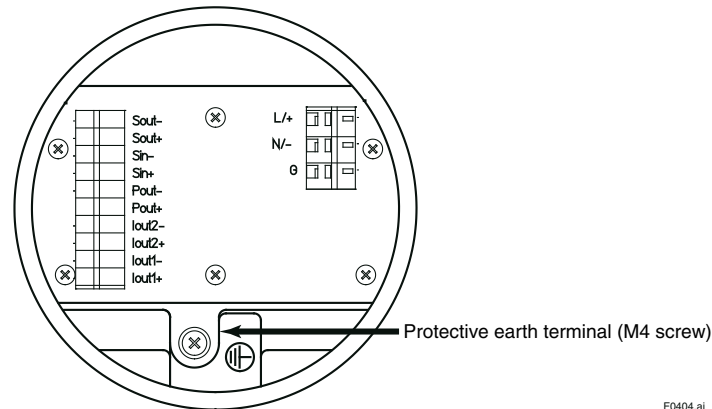
Integral type	Remote type
• Protective earth terminal connected as below  Grounding resistance 10 Ohm or less	• Detector connected to converter via remote cable • Protective earth terminal connected as below  Grounding resistance 10 Ohm or less

F0431.ai

- The location of the protective earth terminal is at the terminal box of converter as shown in figure below.
- In case of remote type, the detector is grounded at the converter. (See figure above.)
- Use insulated PVC wire for 600 V for grounding wire.



F0403 .ai

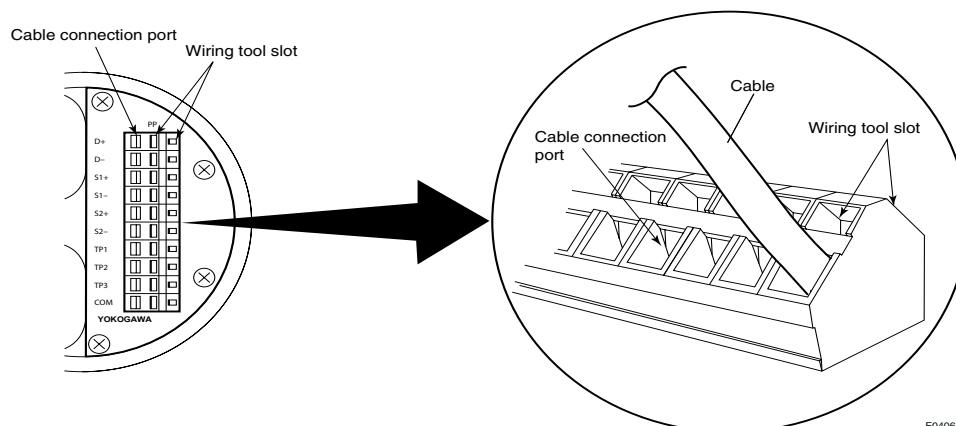


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4.8.3 Wiring technique

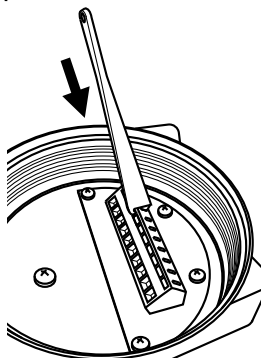
Cable connection on terminal block:

For connecting the cables to power-, I/O- and remote cable connection terminals a special tool is attached to the instrument. The terminal looks as follows:



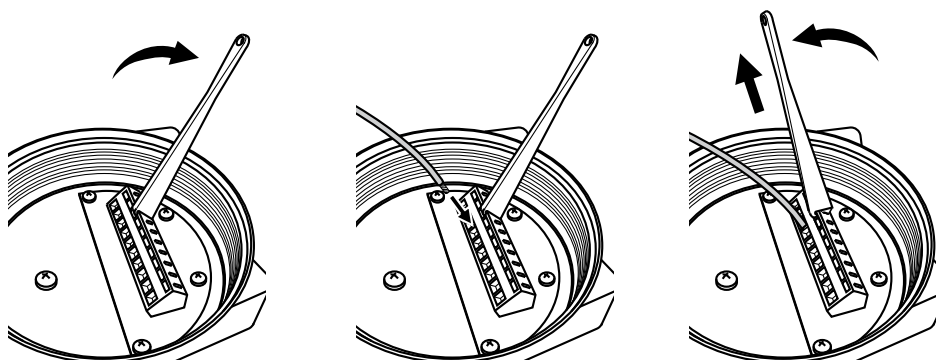
F0406.ai

Insert the auxiliary tool from the top into the terminal block.



F0407.ai

Tilt the tool until it opens the cable port and insert the cable. Tilt the tool back and the opening is closed and the cable is fixed. Remove the tool. Fix the wires one at a time, please make sure that is secured to the wiring terminal block.



F0408.ai



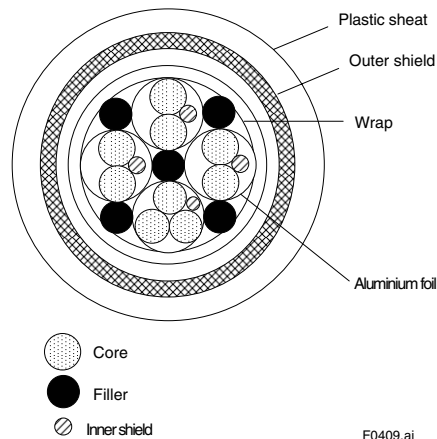
IMPORTANT

- Do external electrical connection in conformity with EN 61010-1 or equivalent national regulations. For hazardous area installation in Europe (ATEX) use standard EN 60079-14 as a guideline.
- Do not switch power supply on before all wiring is finished.

4. INSTALLATION

4.8.4 Assembling and connecting the Remote Cable RCCY03

Remote type converter RCCF31 / RCCR31 are used with remote type detector RCCS3. To connect these instruments use pair- / triple-twisted cable with overall shielding type Li2Y(st)+CY 3x2AWG24 + 1x3 AWG20 exclusive cable RCCY03. The maximum length is 300 m / 984 ft; 50 m/164 ft for FM-applications
Cross-sectional view of remote cable RCCY03:

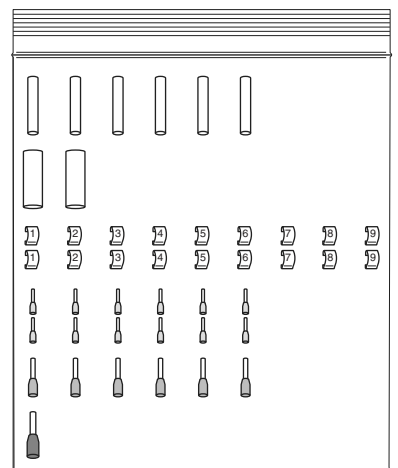


For RCCY03 -1-L the cable is completely terminated.

For RCCY03 -0-L the termination set is attached and the customer has to terminate the cable by his own.

The termination set contains:

- 6 x 20 mm 0.15 m shrink down plastic tube, d= 3.2 mm
- 2 x 20 mm 0.05 m shrink down plastic tube, d= 4.8 mm
- 18 conductor markers
- 12 terminal sleeves 0.25 mm² light blue
- 6 terminal sleeves 0.5 mm² orange
- 1 terminal sleeve 1.5 mm²



For ATEX explosion proof application cable RCCY03-xLxxx /KS1 (blue color) is recommended.



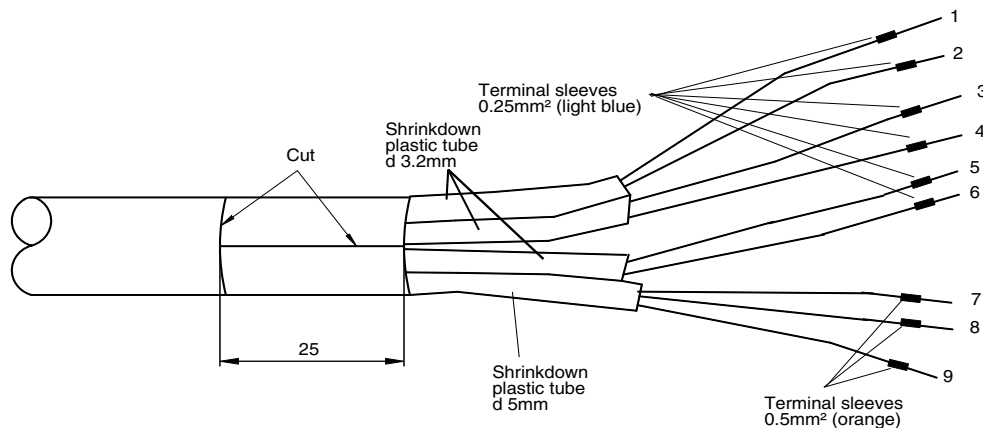
NOTE

Careful assembly of the cable is indispensable for correct connection between the detector and the converter. This ensures good measuring results.

Termination procedure:**Cable end detector**

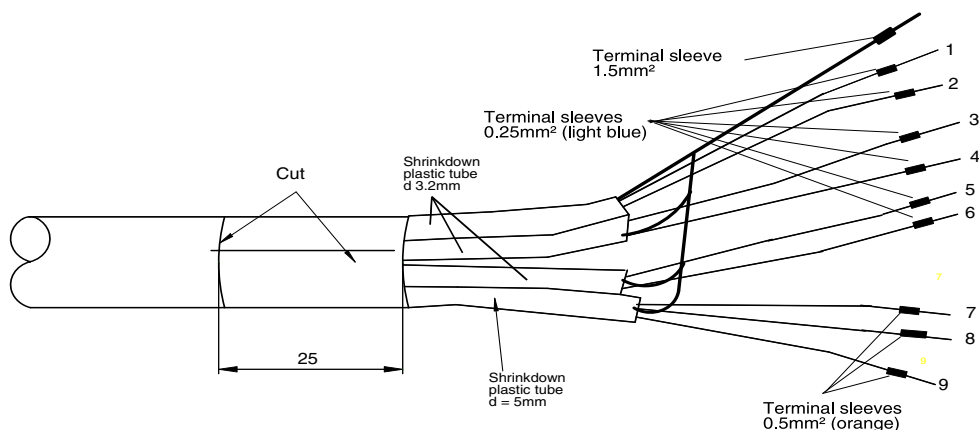
- Remove PVC outer sheathing and outer shielding 100 mm from the end.
- Remove the clear wrap and the filler material.
- Remove the foil that is around the isolated wires.
- Clip off each drain wire close to the cable jacket.
- Slide a shrink down plastic tube ($d = 3.2 \text{ mm}$, $l = 20 \text{ mm}$) over each of the 3 pairs and a shrink down plastic tube ($d = 4.8 \text{ mm}$, $l = 20 \text{ mm}$) over the triple of wires, push it to the cable jacket and heat with hot air.
- Strip 8 mm of the cable ends.
- Fix the light blue terminal sleeves (0.25 mm^2) to the wire endings of the 3 cable pairs.
- Fix the orange terminal sleeves (0.5 mm^2) to the wire endings of the cable triple
- Make a radial cut into the PVC outer sheathing 25 mm from the end and cut lengthwise.

Rotamass Remote Cable RCCY03 : Detector RCCS side

**Cable end converter**

- Remove PVC outer sheathing and outer shielding 100 mm from the end.
- Remove the clear wrap and the filler material.
- Remove the foil that is around the isolated wires.
- Do not clip off the drain wires !
- Twist the 4 drain wires together and fix the 1.5 mm^2 terminal sleeve.
- Slide a shrink-down plastic tube ($d = 3.2 \text{ mm}$, $l = 20 \text{ mm}$) over each of the 3 pairs and a shrink down plastic tube ($d = 4.8 \text{ mm}$, $l = 20 \text{ mm}$) over the triple of wires, push it to the cable jacket and heat with hot air.
- Strip 8 mm of the cable ends.
- Fix the light blue terminal sleeves (0.25 mm^2) to the wire endings of the 3 cable pairs.
- Fix the orange terminal sleeves (0.5 mm^2) to the wire endings of the cable triple
- Make a radial cut into the PVC outer sheathing 25 mm from the end and cut lengthwise.
- Slide the conductor markers onto the pairs of wires on both sides of the cable, so that the pairs are numbered 1-2, 3-4, 5-6 and the triple 7-8-9. Each cable must have the same number on detector and on converter side.

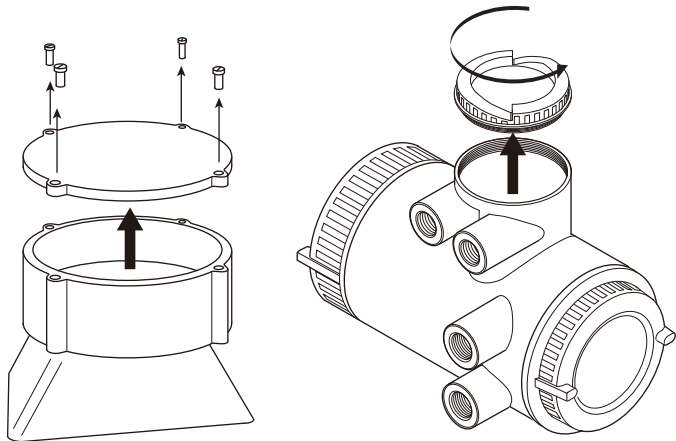
Rotamass Remote Cable RCCY03 : Converter RCCF31 side



4. INSTALLATION

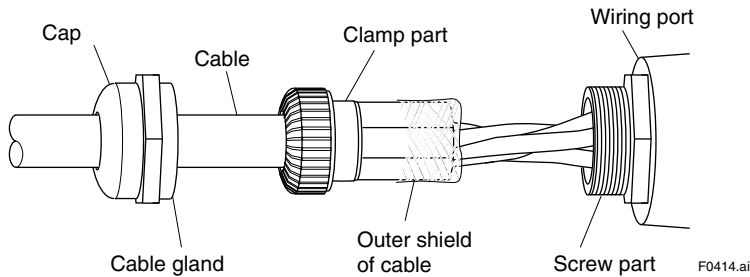
Cable connection to detector RCCS3 and field-mount converter RCCF31:

1. Remove connection box cover detector and converter (see figure below).



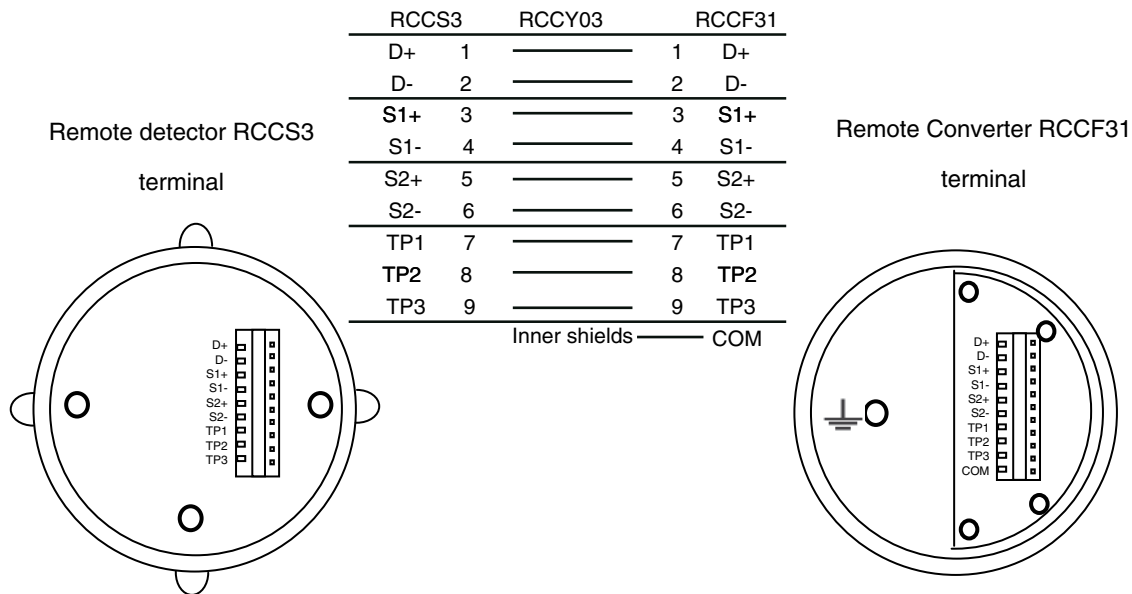
F0413.ai

2. Loosen the thread of cable gland and insert the cable into the cap and the clamp part. (See figure below.)
3. Remove the PVC outer sheathing 25 mm from the end and fold back outer shield over the clamp part. (See figure below.)



F0414.ai

4. Tighten the cable gland.
5. Connect the numbered leads to the terminals as shown in the figure below.
6. Connect inner shields to terminal COM.

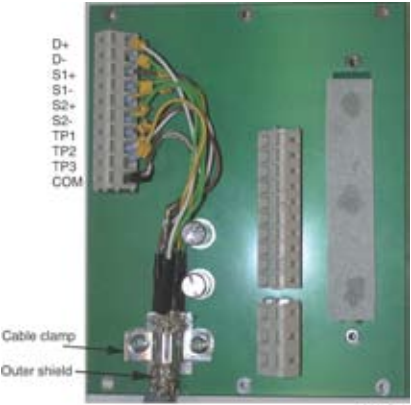


F0415.ai

7. Close the connection box covers.

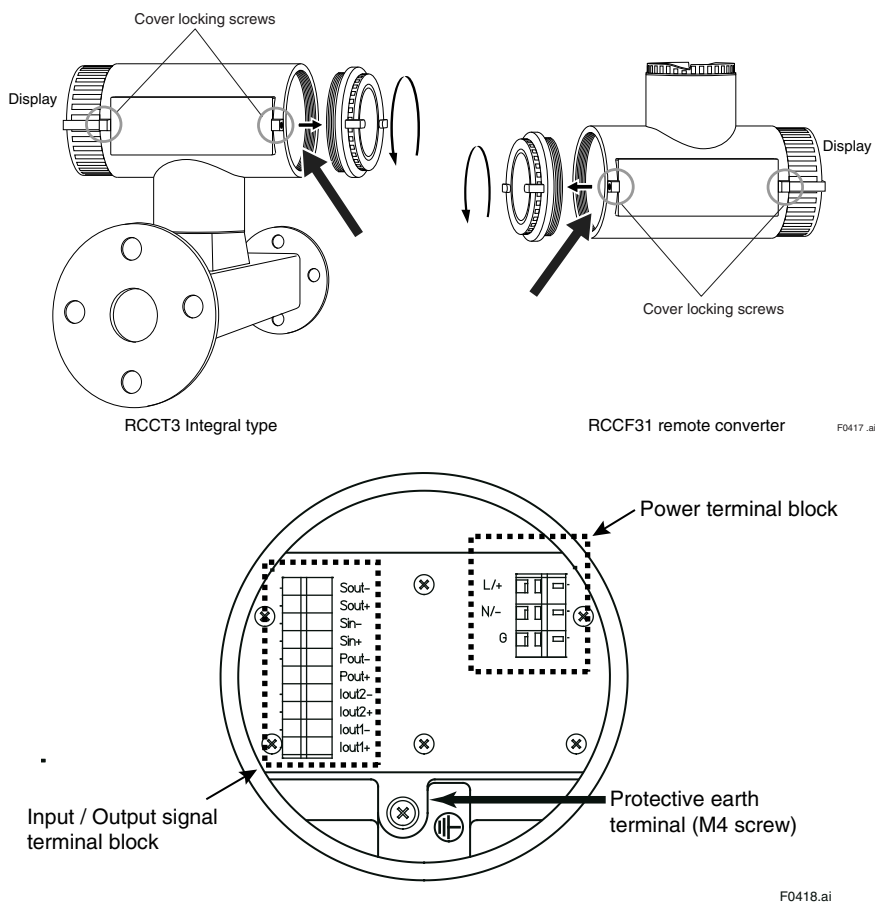
Cable connection to rack-mount converter RCCR31:

1. Loose the cable clamp on terminal board
2. Remove the 25 mm section of PVC outer sheathing from the cable and fix the outer ring of the cable with the cable clamp on terminal board. (see left figure below).
3. Connect the numbered leads to the terminals as shown in the right figure below.
4. Connect inner shields to terminal COM.

	<table border="1"> <thead> <tr> <th>Detector</th><th>Cable</th><th>Converter</th></tr> </thead> <tbody> <tr> <td>RCCS3</td><td>RCCY03</td><td>RCCR31</td></tr> <tr> <td>D+</td><td>1</td><td>D+</td></tr> <tr> <td>D-</td><td>2</td><td>D-</td></tr> <tr> <td>S1+</td><td>3</td><td>S1+</td></tr> <tr> <td>S1-</td><td>4</td><td>S1-</td></tr> <tr> <td>S2+</td><td>5</td><td>S2+</td></tr> <tr> <td>S2-</td><td>6</td><td>S2-</td></tr> <tr> <td>TP1</td><td>7</td><td>TP1</td></tr> <tr> <td>TP2</td><td>8</td><td>TP2</td></tr> <tr> <td>TP3</td><td>9</td><td>TP3</td></tr> <tr> <td></td><td>Shields</td><td>COM</td></tr> </tbody> </table>		Detector	Cable	Converter	RCCS3	RCCY03	RCCR31	D+	1	D+	D-	2	D-	S1+	3	S1+	S1-	4	S1-	S2+	5	S2+	S2-	6	S2-	TP1	7	TP1	TP2	8	TP2	TP3	9	TP3		Shields	COM
Detector	Cable	Converter																																				
RCCS3	RCCY03	RCCR31																																				
D+	1	D+																																				
D-	2	D-																																				
S1+	3	S1+																																				
S1-	4	S1-																																				
S2+	5	S2+																																				
S2-	6	S2-																																				
TP1	7	TP1																																				
TP2	8	TP2																																				
TP3	9	TP3																																				
	Shields	COM																																				

4.8.5 Power supply wiring

The terminals for the power supply and for the I/O ports are in a separate terminal box as shown in the figures below.



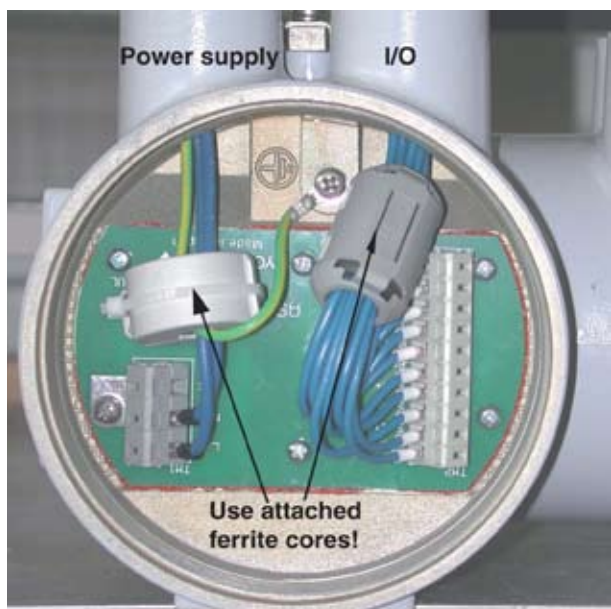
4. INSTALLATION



CAUTION

1. Before starting the wiring, turn off the source of the supply power and check with the tester that there is no voltage at the cable.
2. For RCCT3 / RCCF31 the protective ground conductor must be connected to the separate PE terminal in the terminal box with Crimp-on ring-type terminal in order to avoid personal shock hazard.
2. For RCCR31 the protective ground conductor must be connected to the separate PE terminal on the terminal board in order to avoid personal shock hazard.
3. An exclusive external circuit breaker must be placed near each flowmeter.
4. Check the external circuit breaker's rating conforms to the requirements specified in the specification of this instrument.
5. Wire the power supply cable keeping the distance of 1 cm or more from other signal wires.
6. Confirm the operating voltage of the converter before operation.
7. Please lock the cover of the converter with hexagon lock screw before operation (only RCCT3 /RCCF31)

- Connect the power supply cable to the terminals inside of the converter terminal box (RCCT3 /RCCF31) or on terminal board (RCCR31).
- Confirm two ferrite core sets are attached to the flowmeter.
- Insert the cables into ferrite core before connecting to the terminals. Fix the ferrite core to the cable with clamping wire.
- Connect the power cables to the terminals according to the figure below.
- For the connection of protective ground conductor to PE terminal of RCCF31 / RCCT3 use a crimp-on ring type terminal. For RCCR31 connect the protective ground conductor to PE terminal of terminal board.



RCCT3 / RCCF31



RCCR31

**CAUTION**

Special connections for Ex version :

The converter case must be connected to the potential equalisation facility of the hazardous area , e.g. to the U-clamp PA terminal on the outside at the converter. Please refer to chapter 9 "EXPLOSION PROTECTED TYPE INSTRUMENTS".

Power supply cable

Cable : Use cables acc. to VDE 0250, VDE 0281 or equivalents.

Outer diameter : DIN and NPT cable gland: 6.5 to 10.5 mm in diameter

Nominal cross section of conductive wire : 0.5 to 2.5 mm²

Outer diameter of cores insulation part : < 3.6 mm

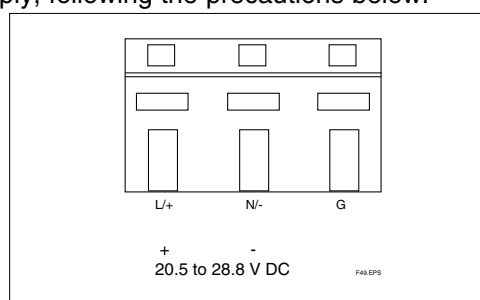
Connecting length of conductive wire part : < 9 mm

24V DC connections

For the DC power supply type, connect a 24 V DC power supply, following the precautions below.

1. Connecting Power Supply

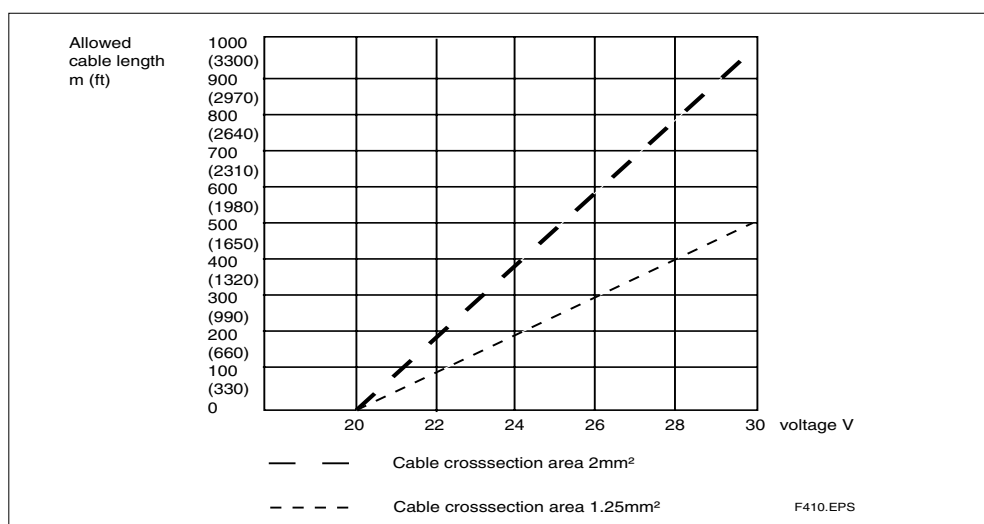
Please refer to the Figure in right. AC power supplies can not be connected. Confirm the polarity of DC power supply.

**2. Supply voltage rating**

The specification for the supply voltage is 20.5 – 28.8 V DC. But because the input voltage of the converter drops due to cable resistance, it should be used within the following range.

3. Ground connection

Connect ground as shown on page 4-8 due to EMC protection.

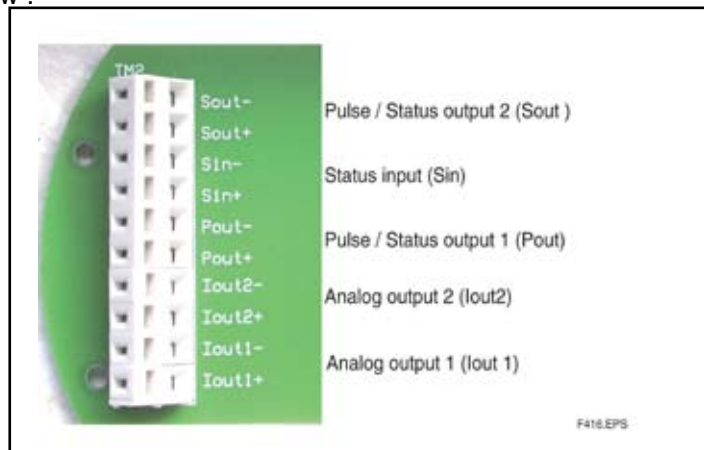


4. INSTALLATION

4.8.6 Connecting to external instruments

- Use cables with cross section 0.08 to 0.5 mm²
- Connect the cables from the external instruments to the terminals inside of the converter terminal box (RCCT3 / RCCF31 or on terminal board (RCCR31).
- Confirm two ferrite core sets are attached to the flowmeter.
- Insert the cable into ferrite core before connecting to the terminals. Fix the ferrite core (see figure on page 4-16)
- Connect the cables to the terminals according to the figure below.

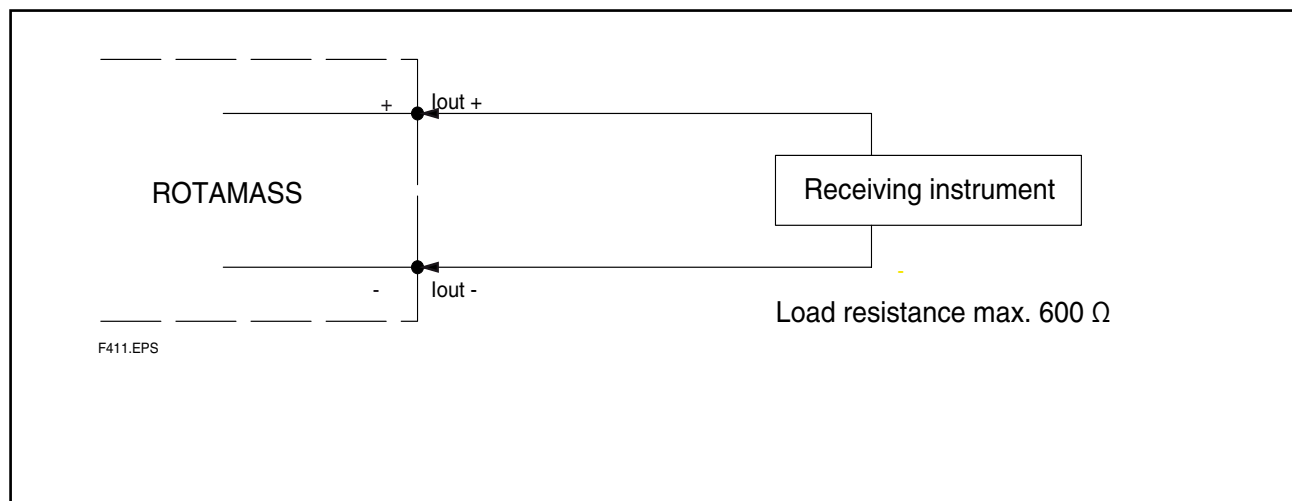
I/O-Terminal Overview :



1. Analog signal output (Iout 1 and Iout 2)

ROTAMASS has 2 analog outputs, 4 to 20 mA DC.

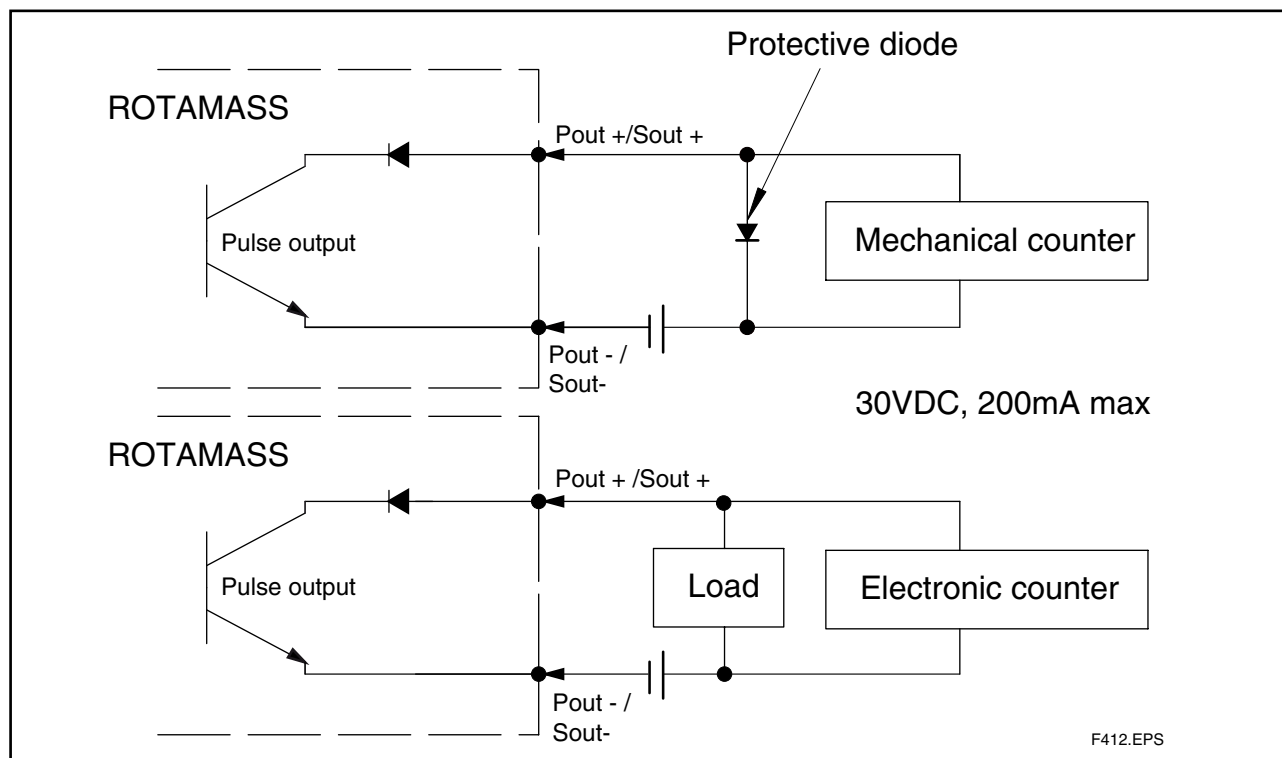
Load resistance 20- 600 Ω (/KF2 has only one analog output, which is intrinsic safe. See chapter 4.8.8).



2. Pulse Output passive (Pout / Sout)

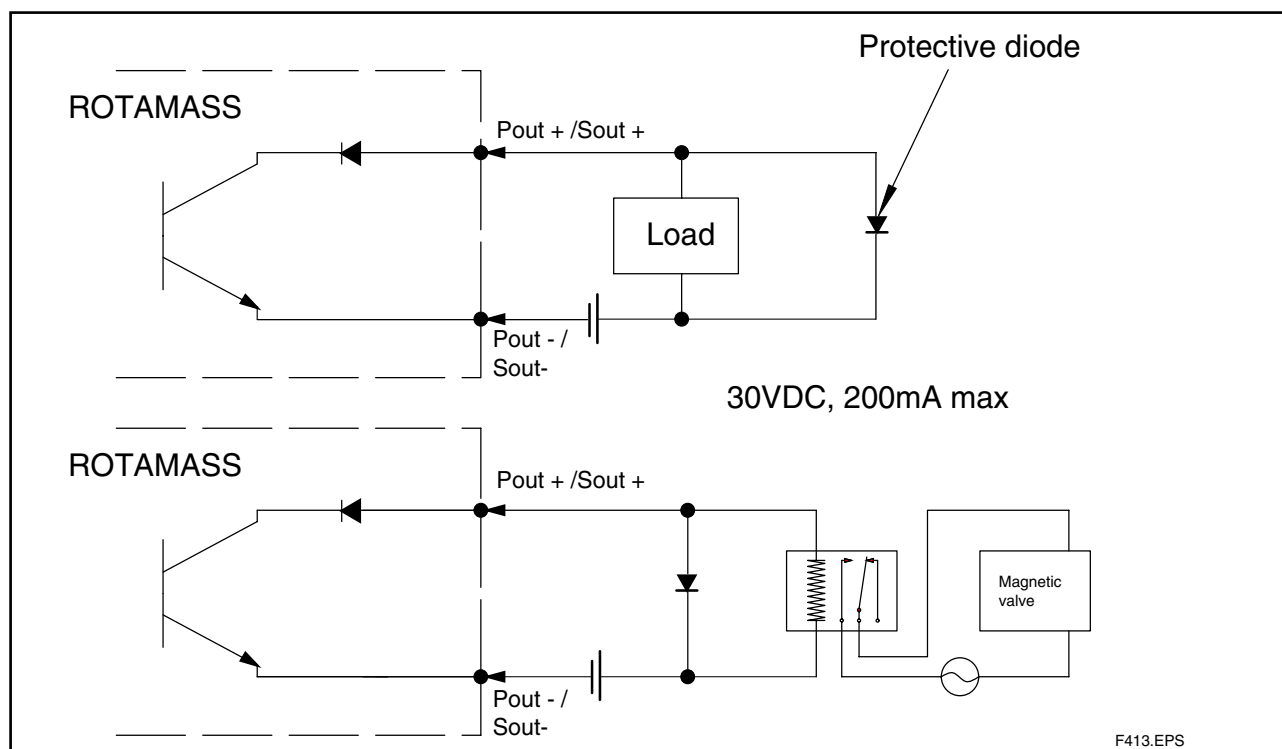
ROTAMASS has 2 pulse outputs (isolated transistor contact).

Attention must be paid to voltage and polarity when wiring (/KF2 has one passive pulse output, which is intrinsic safe. See chapter 4.8.8)



3. Status Output passive (Pout / Sout)

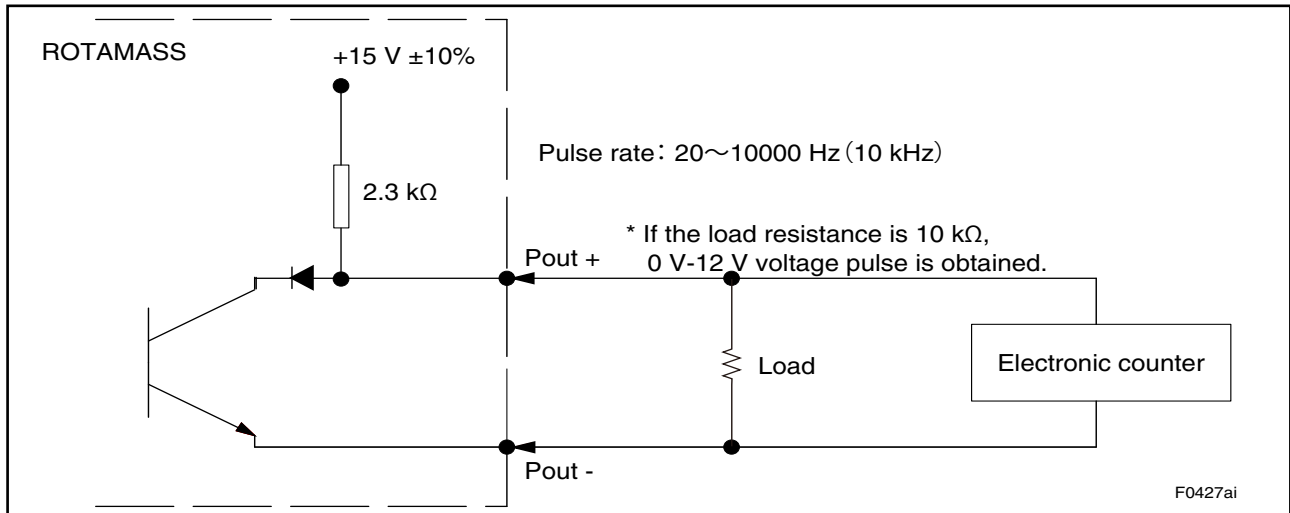
The pulse outputs can be set to status outputs by menu item. Since this is an isolated transistor contact, attention must be paid to voltage and polarity when wiring. This output cannot switch an AC load. To switch an AC load, an intermediate relay (see the figure below) is required.



4. INSTALLATION

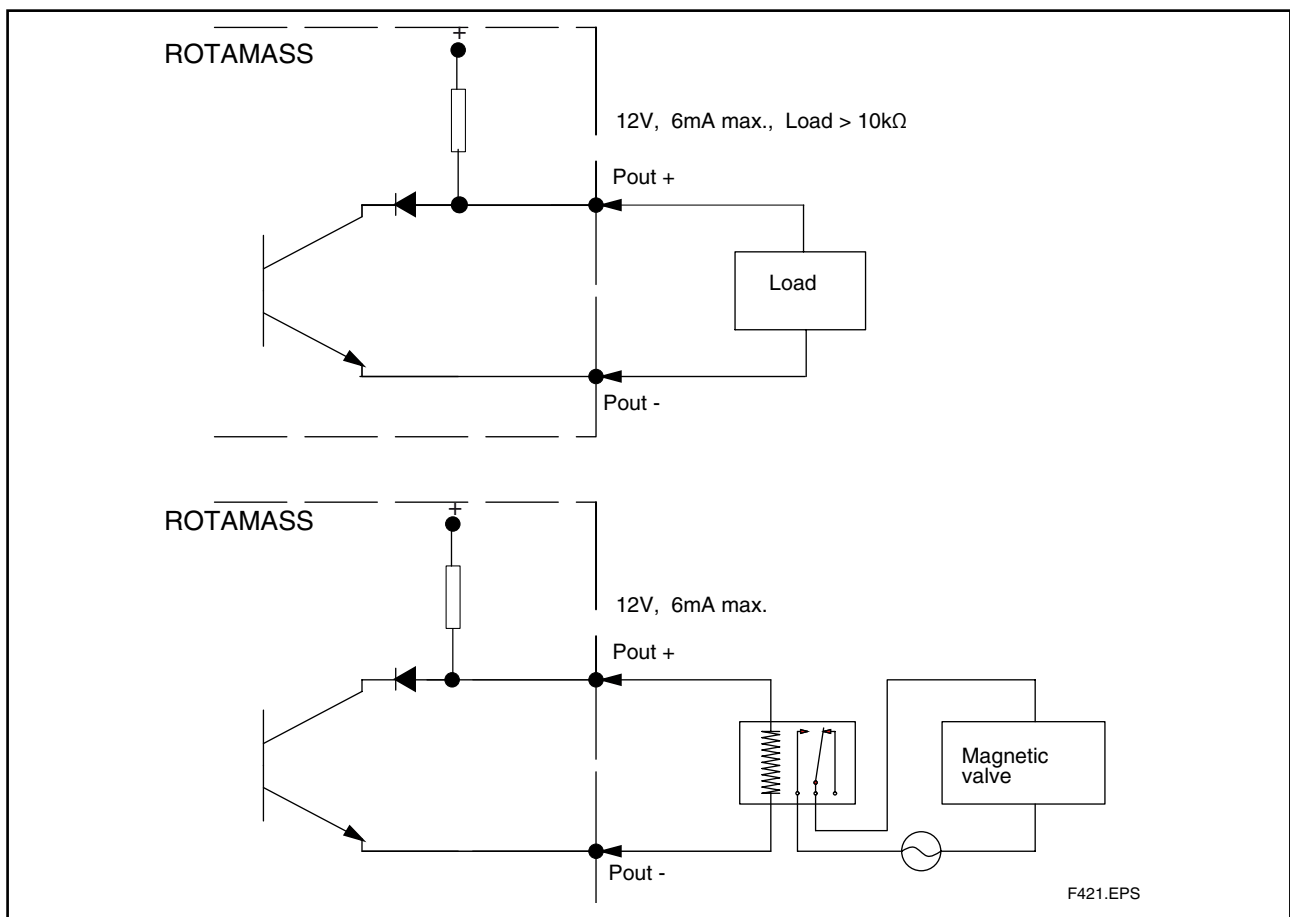
4. Pulse Output active (option /AP)

Pulse output 1 (Pout) can be ordered as active output. Not possible with intrinsic safe outputs option /KF2.



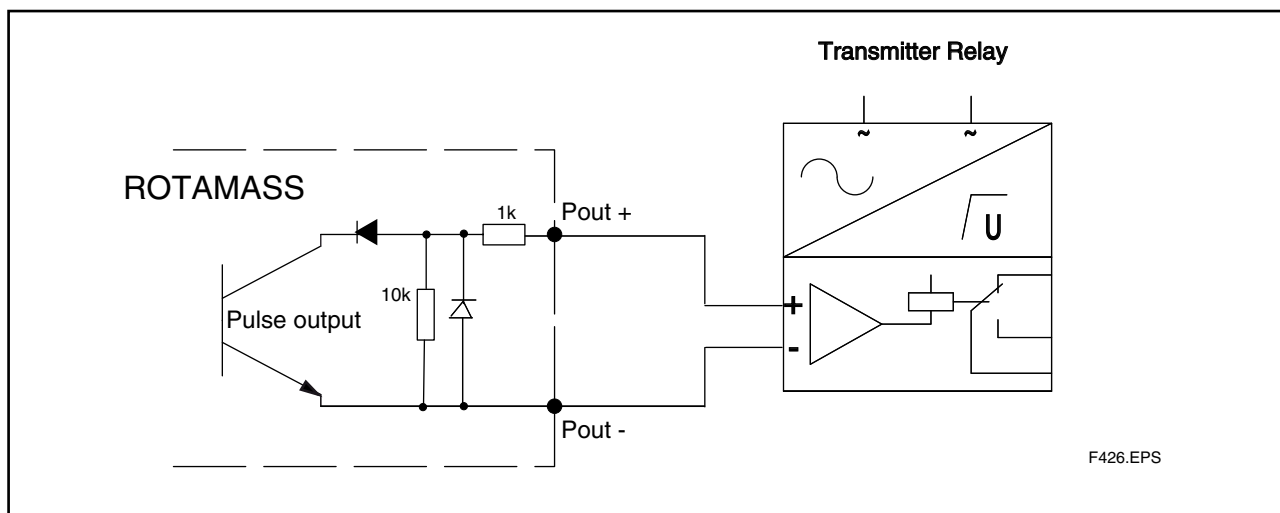
5. Status Output active (option /AP)

Status output 1 (Pout) can be ordered as active output. Not possible with intrinsic safe outputs option /KF2.



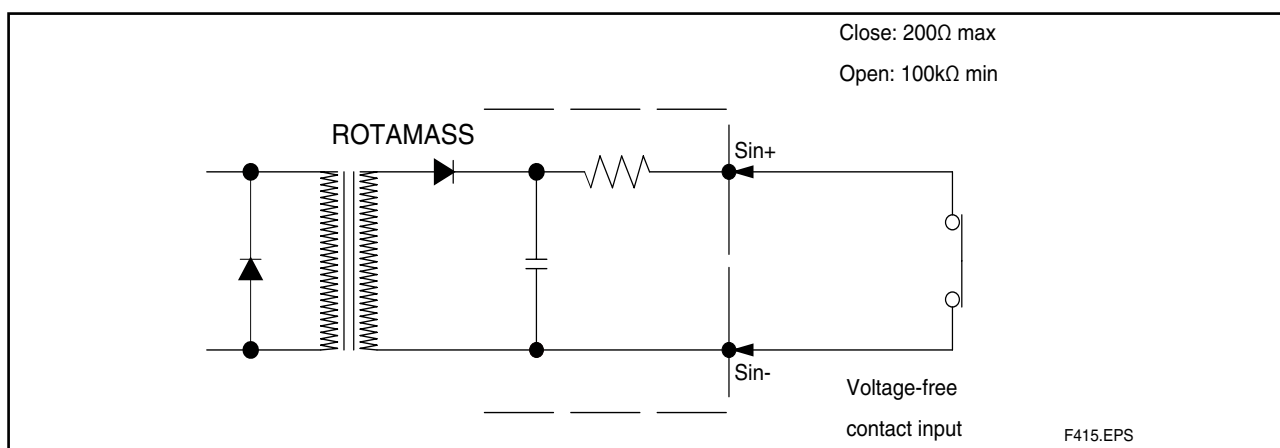
6. Pulse / Status Output according EN 60947-5-6 (NAMUR) (option /NM)

Pulse output 1 (Pout) can be ordered as NAMUR output.



7. Status input (Sin)

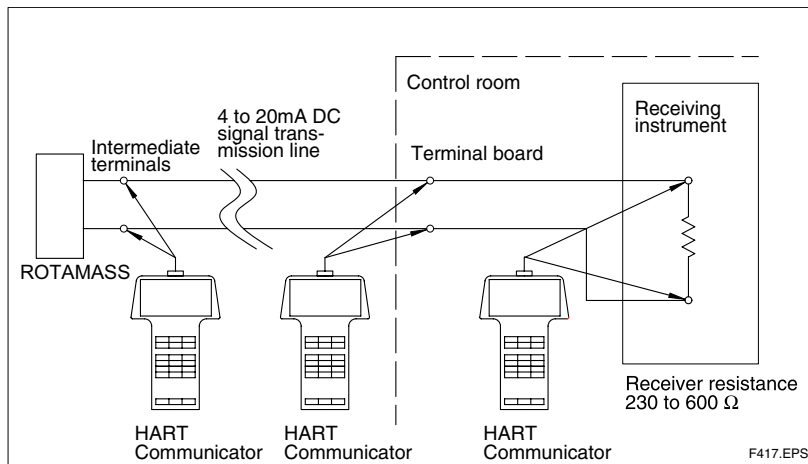
Status input is designed for use with voltage-free ("dry") contact (activate source current to detect the contact state). Be careful not to connect to any signal source carrying any voltage. Applying voltage may damage the input circuit.



4. INSTALLATION

4.8.7 Connecting HART- Communication

HART communication is available on analog output 1 and the HART-communicator is connected via load resistance (230 ... 600 Ω) as shown on the figure below.



4.8.8 Flowmeters with intrinsic safe outputs

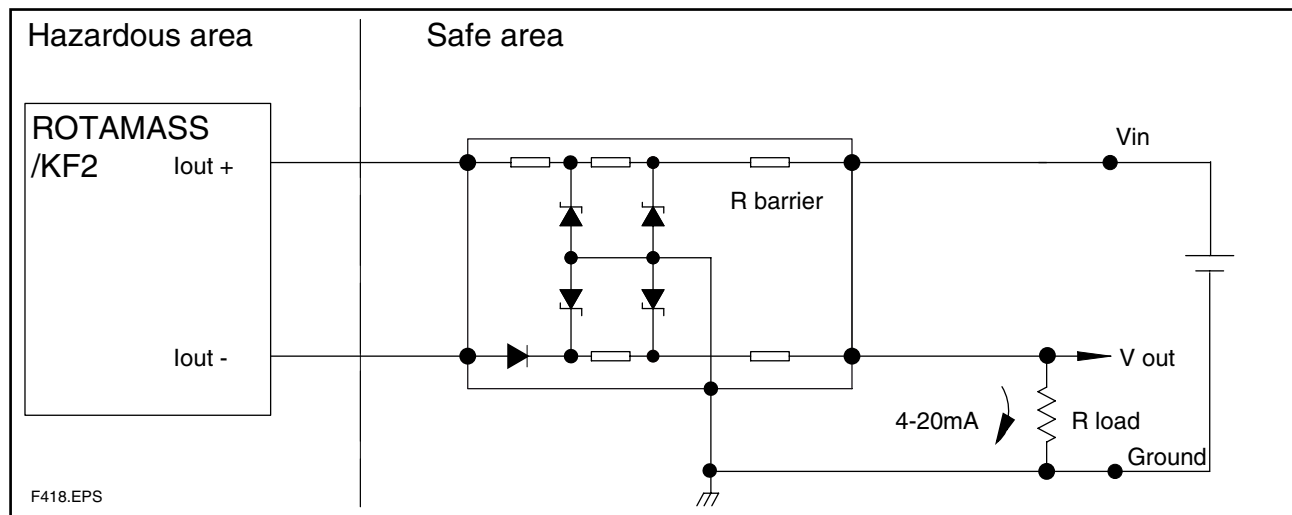
ROTAMASS with option /KF2 has one intrinsic safe current output and one intrinsic safe pulse / status output. The Ex-data of this output can be found in chapter 9.1.

The second current output, the second pulse / status output and the status input are not available.

The concerning parameters in the menu are not visible.

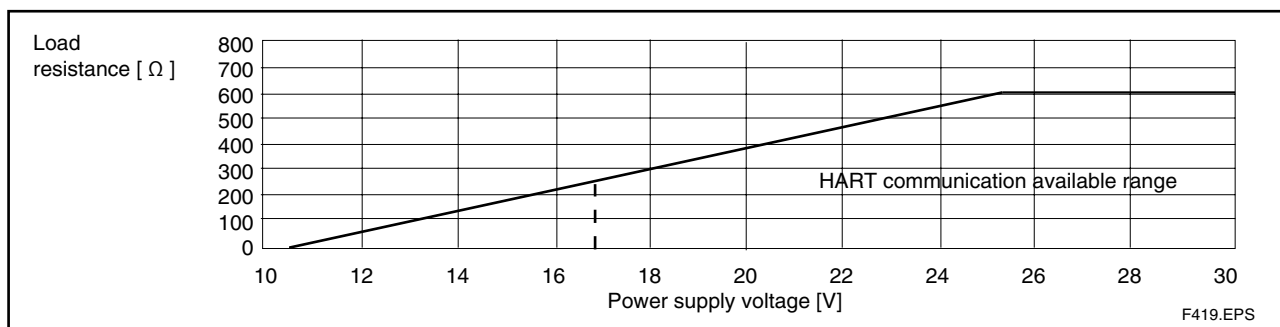
Current output : The intrinsic safe current output is passive and an external power supply with shunt-diode type barrier or isolation type barrier should be connected.

Example of installation :



Power supply range	: 10.5 V ... 30 V DC	for Not-HART application
Power supply range	: 16.75 V ... 30 V DC	for HART application
Load resistance	: 20 ... 600 Ω	for Not-HART application
Load resistance	: 230 ... 600 Ω	for HART application

Load resistance vs Power supply voltage :



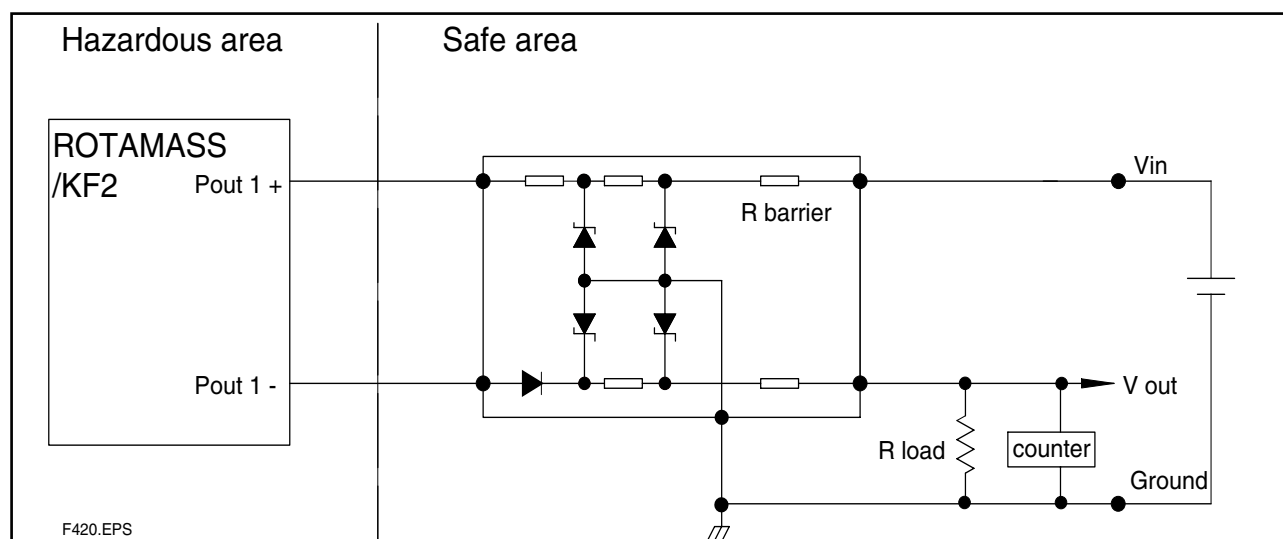
Pulse output :

The intrinsic safe pulse output is passive and an external power supply with shunt-diode type barrier or isolation type barrier should be connected.

Maximum voltage : 30 V DC

Maximum current : 100 mA

Example of installation :



5. BASIC OPERATING PROCEDURES

Data setting can be done by HART-Communication (see chapter 6) or with the 3 keys on the front panel. The following section describes how to use the three panel keys.



IMPORTANT

Operate the display unit under the condition where direct sunlight, etc.... do not shine to the setting switches directly when the parameter setting operation is carried out.



NOTE

- (1) Always use the setting switches with the cover of the ROTAMASS closed.
- (2) Use these switches when covered by the glass window.
- (3) If dirt, dust or other substances surfaces on the display panel glass, wipe them clean with a soft dry cloth.
- (4) The operation with dirty gloves may cause a switch response error.

5.1 Liquid crystal display

Construction of ROTAMASS display :

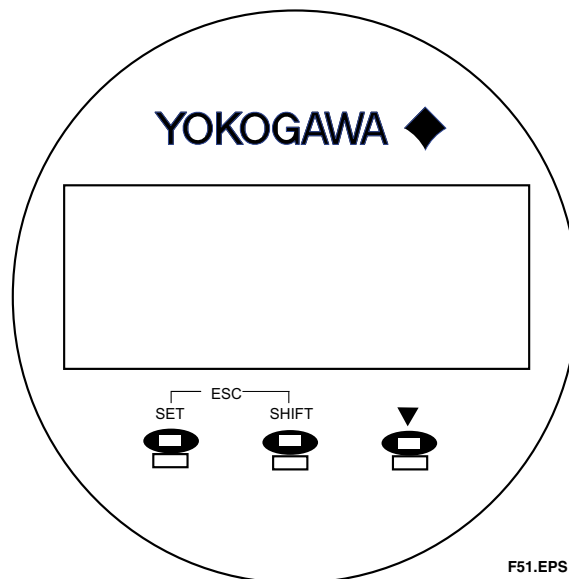
LCD dot matrix (32 x 132 dots)

- 1 line indication or
- 2 line indication or
- 3 line indication or
- 4 line indication

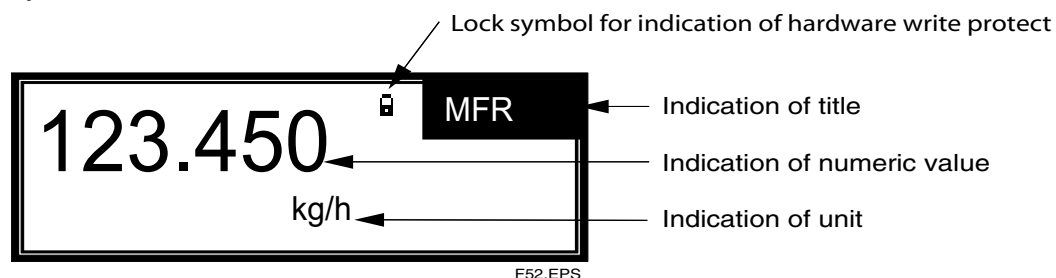
3 infrared switches



SET	: confirm data setting or entry data setting or confirm parameter
SHIFT	: move cursor right to next position
SET + SHIFT	: return to higher menu level
↓	: move to lower parameter or increment value
SHIFT + ↓	: move to upper parameter



General display indication :



+123.450	kg/h	MFR
+12.3400	deg	TMP
0.99700	kg/l	DEN
+12.3450	kg	FTL

4 line indication

+123.450	kg/h	MFR
+ 12.3400	degC	TMP
0.99700	kg/l	DEN

3 line indication

+123.450	kg/h	MFR
+12.3400	degC	TMP

2 line indication.

+123.450	kg/h	MFR
----------	------	-----

1 line indication

F53.EPS

**NOTE**

The infrared switches operate as ON status by detecting the infrared ray reflection from a finger put over the switches through the glass plate of the cover. Switches are just below the printed letters SET, SHIFT,  on the faceplate.

When you touch the switches, please note the following :

The switches may operate even when you do not touch the glass plate, if your fingers come near the glass plate, so please touch the switches sliding with your finger from the lower part of the glass plate. Also be sure not to touch more than one switch at one time by covering your other fingers over the faceplate, unless you would like to push "SHIFT+SET" or "SHIFT+  .

You can increase the sensitivity of the infrared switches by sticking a white piece of tape on your finger tip.

Setting via the infrared buttons can be blocked via the HART protocol. If HART protocol is not used the infrared buttons can be blocked by a black tape glued behind the window.

In the title indication the following abbreviations are used :

MASS FLOW RATE	: MFR	Additional with option /Cx :	
VOLUME FLOW RATE	: VFR	CONCENTRATION	: CON
FORWARD MASS TOTAL	: FTM	NET FLOW	: NET
REVERSE MASS TOTAL	: RTM	FORWARD NET TOTAL	: FTN
DIFFERENTIAL MASS TOTAL	: DTM	REVERSE NET TOTAL	: RTN
FORWARD VOLUME TOTAL	: FTV	DIFFERENTIAL NET TOTAL	: DTN
REVERSE VOLUME TOTAL	: RTV		
DIFFERENTIAL VOLUME TOTAL	: DTV		
DENSITY	: DEN		
TEMPERATURE	: TMP		
FORWARD ENERGY TOTAL	: FTE		
VELOCITY	: VEL		
FORWARD TOTAL FLEX	: FTL		
REVERSE TOTAL FLEX	: RTL		
DIFFERENTIAL TOTAL FLEX	: DTL		
DRIVE GAIN	: DGN		

Number of figures :

totalizer $\leq$ 999999	: 1 sign + 6 figures (e.g. +123456)
totalizer $\leq$ 9999999	: 1 sign + 7 figures (e.g. +1234567)
totalizer $>$ 9999999	: Exponential view (e.g. +1.23E12)
measured value	: 7 figures + 1 sign (e.g. +1234567) or 6 figures + 1 sign + 1 decimal point (e.g. +123.456)
unit	: 10 figures
title	: 3 figures

The contrast of the display can be adjusted with parameter

Detailed setup / Display Config / Disp contrast

The indication period of the display can be adjusted with parameter

Detailed setup / Display Config / Disp period

5.2 Display modes

The display can show the following indication modes :

1	Measuring mode	Actual selected measuring values are shown
2	Parameter setting mode	
2a	Entry mode	A confirmation, that setting via the infrared buttons should really happen
2b	Parameter search mode	Mode to search the parameter, which should be changed
2c	Parameter select mode	Mode to rewrite data. There are 4 types of data : - Select type (not blinking) - Numerical type (blinking) - Numerical type with sign (blinking) - Character type (blinking)
2d	Data confirmation mode	Mode to confirm new value of selected parameter
2e	Data determination mode	Parameter setting is completed
3	Alarm mode	Alarm or Error Code is displayed alternating with measuring mode (2s Alarm / 4s Measure). Warnings are not displayed. Access to Warnings via Self Test/Status.

In measuring mode the actual measured values according the display select parameters are indicated as shown in chapter 5.1. How to set display settings see chapter 5.4.

Parameter setting mode is described in chapter 5.3.

The language of the parameter setting mode can be selected in parameter

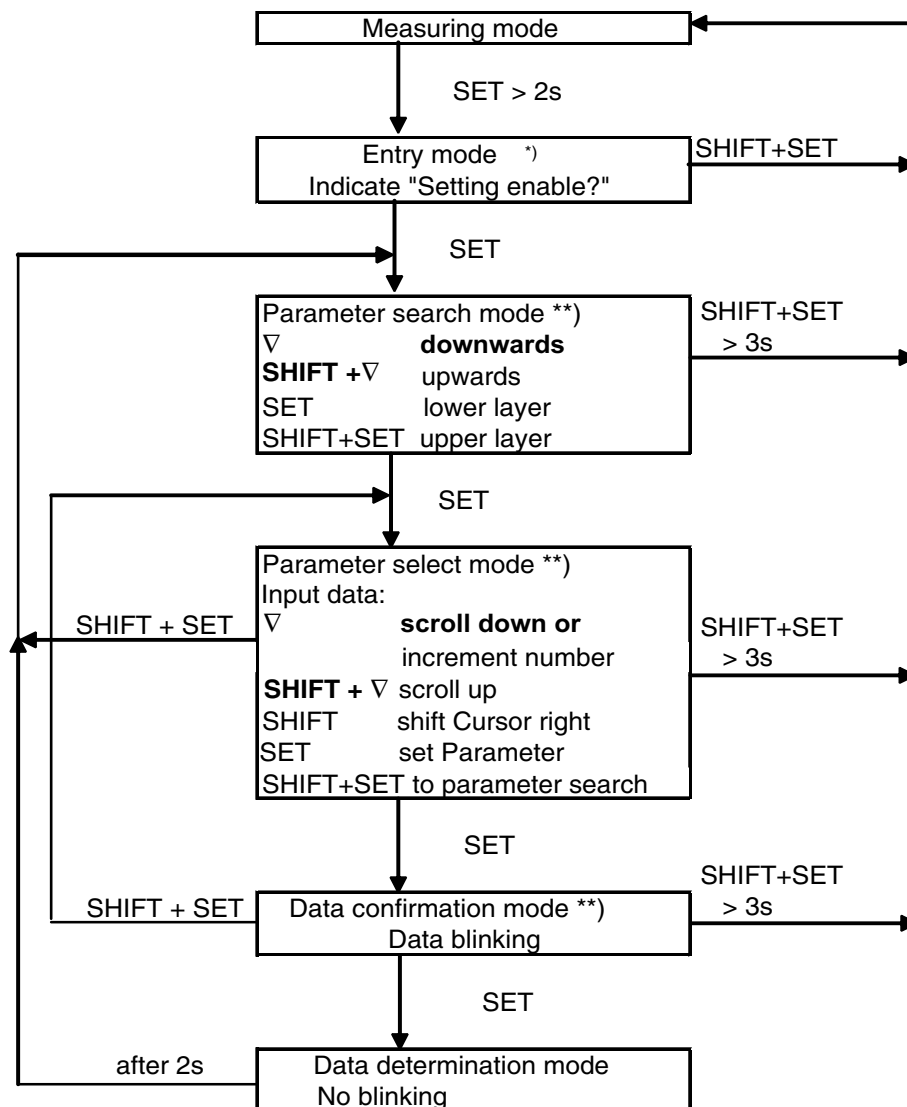
Language / or Detailed setup / Display config / language .

English, German, French or Russian can be selected.

5.3 Setting via keys

The three keys **SET**, **SHIFT**, **▼** are used to set parameters via display menu.
The following flowchart shows how to reach the modes by using the keys :

Chapter 7.2 shows the display parameter list and chapter 7.3 shows the parameter tree.



*) Back to measuring mode if no key is pressed within 10s.

**) Back to measuring mode if no key is pressed within 120s.

F54.EPS



IMPORTANT

The infrared keys can be locked via HART by Hot Key / Key Status.

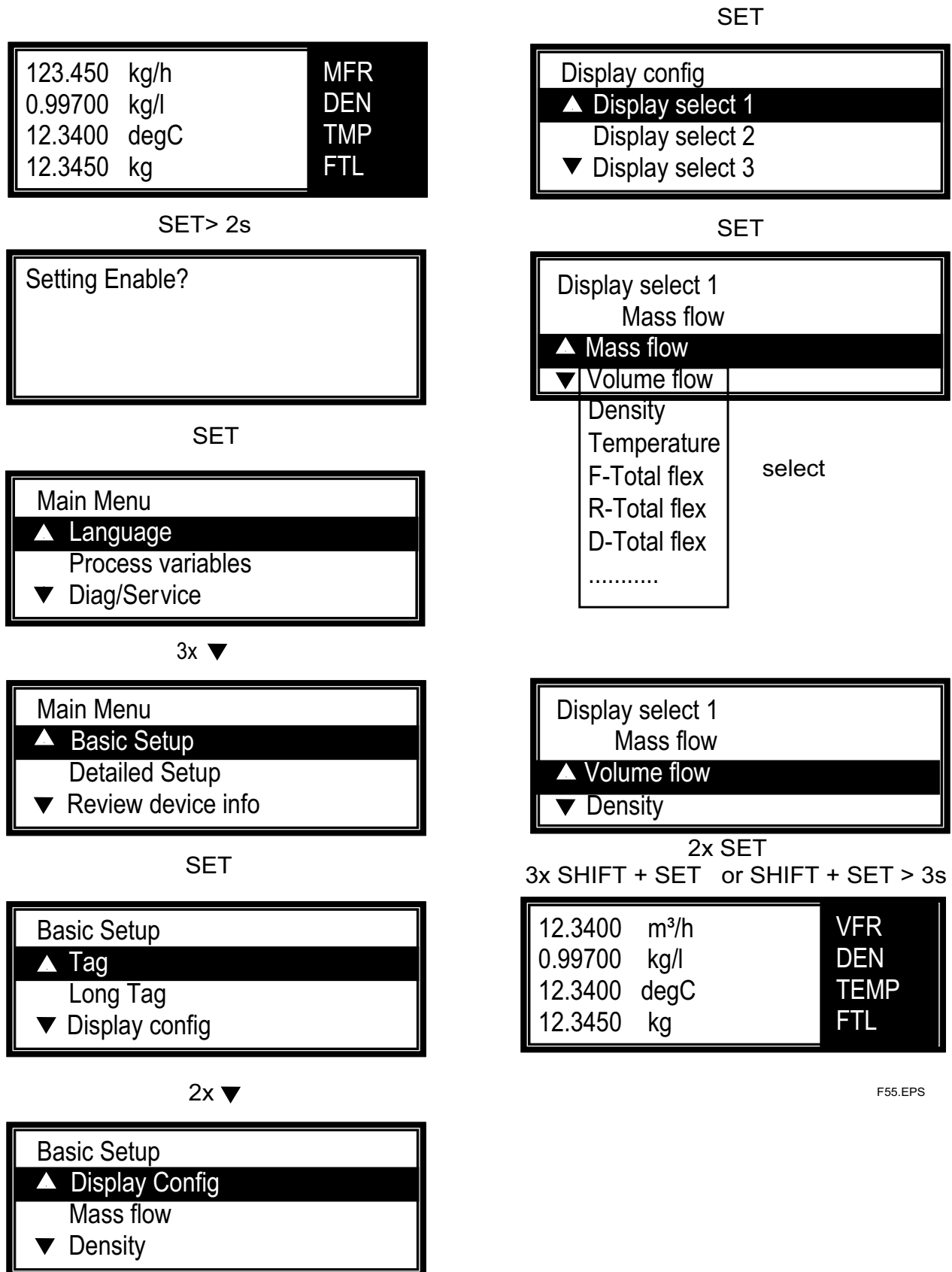


IMPORTANT

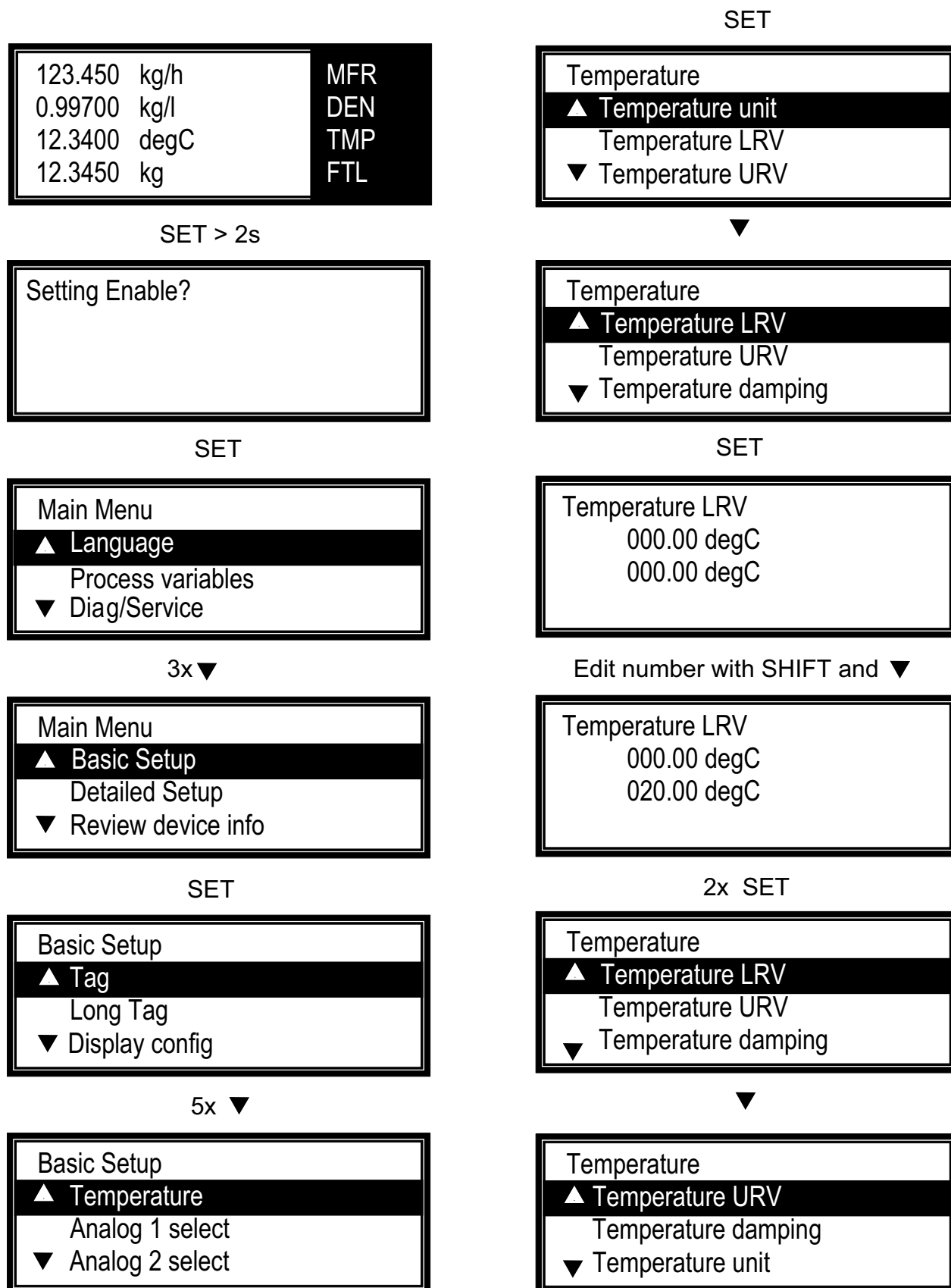
Depending on parameter setting, only relating parameters are visible in the menu. E.g., if Pulse/Stat 1 select is set to Pulse, the parameters concerning status out 1 (SO1) do not appear in the menu. Such dependences are described later in the related chapters.

5.4 Examples of parameter settings via keys

5.4.1 Display configuration, set volume flow to line 1



5.4.2 Setting Temperature 20-120°C to Analog Output 2



F56.EPS

SET

Temperature URV
100.00 degC
000.00 degC

Edit number with SHIFT and ▼

Temperature URV
100.00 degC
120.00 degC

2x SET

Temperature
▲ Temperature URV
Temperature damping
▼ Temperature unit

SHIFT + SET

Basic Setup
▲ Temperature
Analog 1 select
▼ Analog 2 select

2x ▼

Basic Setup
▲ Analog 2 select
Pulse/Status out 1
▼ Pulse/Status out 2

SET

Analog 2 select
Density
▲ Density
▼ Temperature



Analog 2 select
Density
▲ Temperature
▼ None

2x SET

Basic Setup
▲ Analog 2 select
Pulse/Status out 1
▼ Pulse/Status out 2

2 x SHIFT + SET or
SHIFT + SET > 3s

123.450 kg/h	MFR DEN TMP FTL
0.99700 kg/l	
12.3400 degC	
12.3450 kg	

F57.EPS

5.5 Setting parameters in converter with option /NC

If remote converter RCCF31 / RCCR31 was ordered with option /NC (no combination), the customer must set the parameters of the connected detector by himself.

In parameter Detailed Setup / Sensor model the sensor model must be selected. Then, the sensor model depending parameters are set automatically to default value :

Qnom, Mass flow unit, Mass flow LRV, Mass flow URV, Vol flow unit, Vol flow LRV, Vol flow URV, Autozero range, Autozero fluctuation range.

In parameter Detailed Setup / Sensor constants the sensor constants from calibration certificate must be set.

If material of wetted parts is HC see instruction TI 01R04B04-03E-E attached to the converter.

In Parameter Basic setup / Tag or Basic setup / Long tag the tag number must be set if necessary.

5.6 Zero adjustment (Autozero)

After the flow meter is installed into the process pipe work, set up the parameter corresponding to calibration certificate (generally set up in the factory) and perform the pre-operation zero adjustment.



IMPORTANT

Zero adjustment is required before beginning operation in order to obtain the output signals are accurately proportional to the flow.

Zero adjustment is performed to set the instrument to 0% when the flow rate is 0.



IMPORTANT

- **Stop flow before starting autozero** (valve on outputs).
- During autozero time
 - Flow is fixed to zero
 - Totalizer stops counting.
 - Display switches do not work.

Following procedure should be executed after installation but before starting measurement to get best measuring results:

- Flush the meter with the fluid under process conditions.
- Stop flow, the best way is closing valves upstream and downstream.
- Wait 2 minutes in which density, temperature and pressure should stabilize.
- Density check:
 - for measurement of liquids control via expected medium density reading that the measuring tubes are gas free (density not lower than expected. Do not forget to insert the process pressure and pressure unit for the pressure compensation via Detailed Setup / Config Fld vars / Dens).
 - for measurement of gases there is no possibility to check the density reading as the density value of gases is lower than 0.3 kg/l and the ROTAMASS switches automatically to 0 kg/l, see chapter 7.7.
- Perform Autozero.
- Store the Autozero value in Autozero History if required. (Only if you enter the date the values will be stored).
- Flow measurement can start.



CAUTION

For setting a proper Autozero the conditions have to be well defined. Under certain circumstances it is recommended not to perform Autozero but use the Autozero value set during flow calibration in the factory:

- zero flow condition cannot be guaranteed while valves may be not tight
- two or multi phase medium whether the phases separates under no flow condition
- two phase medium whether there is gas contained in the fluid phase or liquid particles in the gas phase



WARNING

ROTAMASS incorporates two measuring tubes which vibrates at a resonance frequency between 100 Hz and 200 Hz. Under certain circumstances there is a similar resonance frequency in the pipe work or fixture which might be excited. In this case high zero fluctuation may occur and Autozero value can't be executed properly. Changes in the mechanical support of the detector should be done to decouple the detector from the vibrating structures.

How to perform Autozero via keys :

123.450 kg/h	MFR
0.99700 kg/l	DEN
12.3400 degC	TMP
12.3450 kg	FTL

SET > 2s

Setting Enable?

SET

Main Menu
▲ Language
Process variables
▼ Diag/Service

2x ▼

Main Menu
▲ Diag/Service
Basic Setup
▼ Detailed Setup

SET

Diag/Service
▲ Selftest/Status
Input/Output test
▼ Autozero check

2x ▼

Diag/Service
▲ Autozero check
Autozero
▼ Output trim

▼

Diag/Service
▲ Autozero
Output trim
▼ Self Test / Status

SET

Autozero
Zero tuning

SET

Autozero tuning
Inhibit
▲ Inhibit
▼ Enable

▼

Autozero tuning
Inhibit
▲ Enable

2x SET

Autozero tuning
Enable

2x SET

Autozero
▲ Zero tuning
Auto zero time
▼ Auto zero exe

2x ▼

Autozero
▲ Auto zero exe
Autozero value
▼ Zero tuning

SET

Auto zero exe
▲ Not execute
▼ Execute

▼

F58.EPS

Auto zero Exe
▲ Execute
▼ Not Execute

2x SET

Autozero
Autozero exe
Doing Autozero 180sec

After 30s /180s

Autozero
Auto zero Exe
XXX.XXkg/h

After 3s

Autozero
Date (DD/MM/YYYY)
00/00/2000

Set date with SHIFT+ ▼. Then press 2x SET
 → Autozero data are written in Autozero history.
 3x SHIFT + SET → Measuring mode

F58a.EPS

Reading Autozero history (see also chapter 7.24) :

123.450 kg/h	MFR
0.99700 kg/l	DEN
12.3400 degC	TMP
12.3450 kg	FTL

SET> 2s

Setting Enable?

SET

Main Menu
▲ Language
Process variables
▼ Diag/Service

2x ▼

Main Menu
▲ Diag/Service
Basic Setup
▼ Detailed Setup

SET

Diag/Service
▲ Selftest/Status
Input/Output test
▼ Autozero check

2x ▼

Diag/Service
▲ Autozero check
Autozero
▼ Output trim

SET

Autozero check
▲ Autozero history
Autozero initial
▼ Autozero range

SET

Autozero history
05/05/2003
10/06/2003
▼ 15/07/2004

SET

AZ hist : 05/05/2003
+ 0000.00 kg/h
+ 00.0000 kg/l
+ 0030.00 degC

SHIFT+ SET

Autozero
05/05/2003
10/06/2003
▼ 15/07/2004

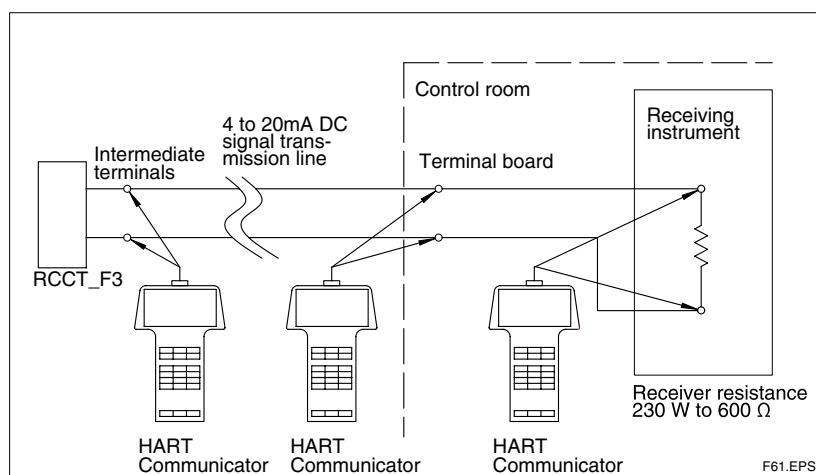
F59.EPS

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6. OPERATION VIA HART

6.1 Conditions of communication line

A HART-communicator can communicate with the ROTAMASS RCCT_F3 from the control room, the ROTAMASS site or any other wiring termination point in the loop, provided there is a minimum load resistance of 230Ω between the connection and the instrument. To communicate, it must be connected in parallel with the ROTAMASS RCCT_F3, the connections are not polarized. The figure below shows the wiring connections for direct interface at the ROTAMASS RCCT_F3.



Specifications of communication line :

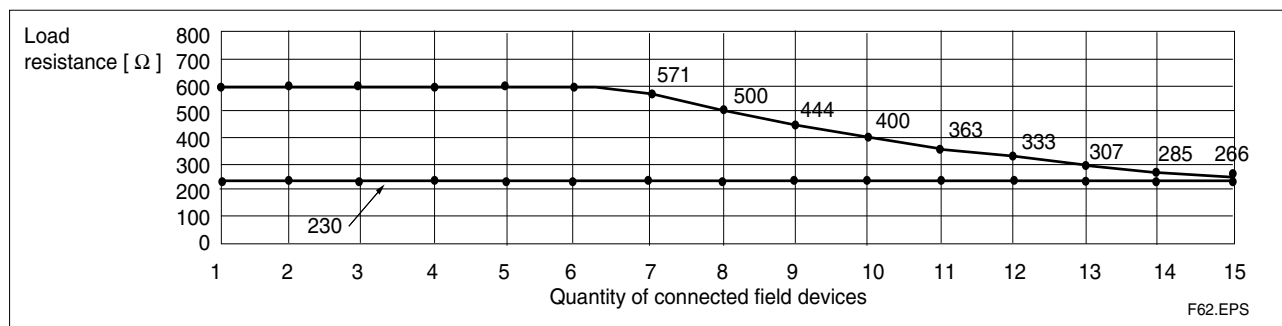
Load resistance	:	230 to 600 Ω, for multidrop mode see figure below
Minimum cable size	:	24 AWG (0.51 mm diameter)
Cable type	:	single pair shielded or multiple pair with overall shield
Maximum twisted pair length	:	6,500 ft (2,000 m)
Maximum multiple twisted pair length	:	3,200 ft (1,000 m)

Use the following formula to determine cable length for a specific application :

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10,000)}{C}$$

Where :
 L = length in feet or meters
 R = resistance in ohms, current sense resistance
 C = cable capacitance in pF/ft or pF/m
 C_f = 50,000 pF

Load resistance and quantity of devices in multidrop mode :



6.2 Communication via FieldMate

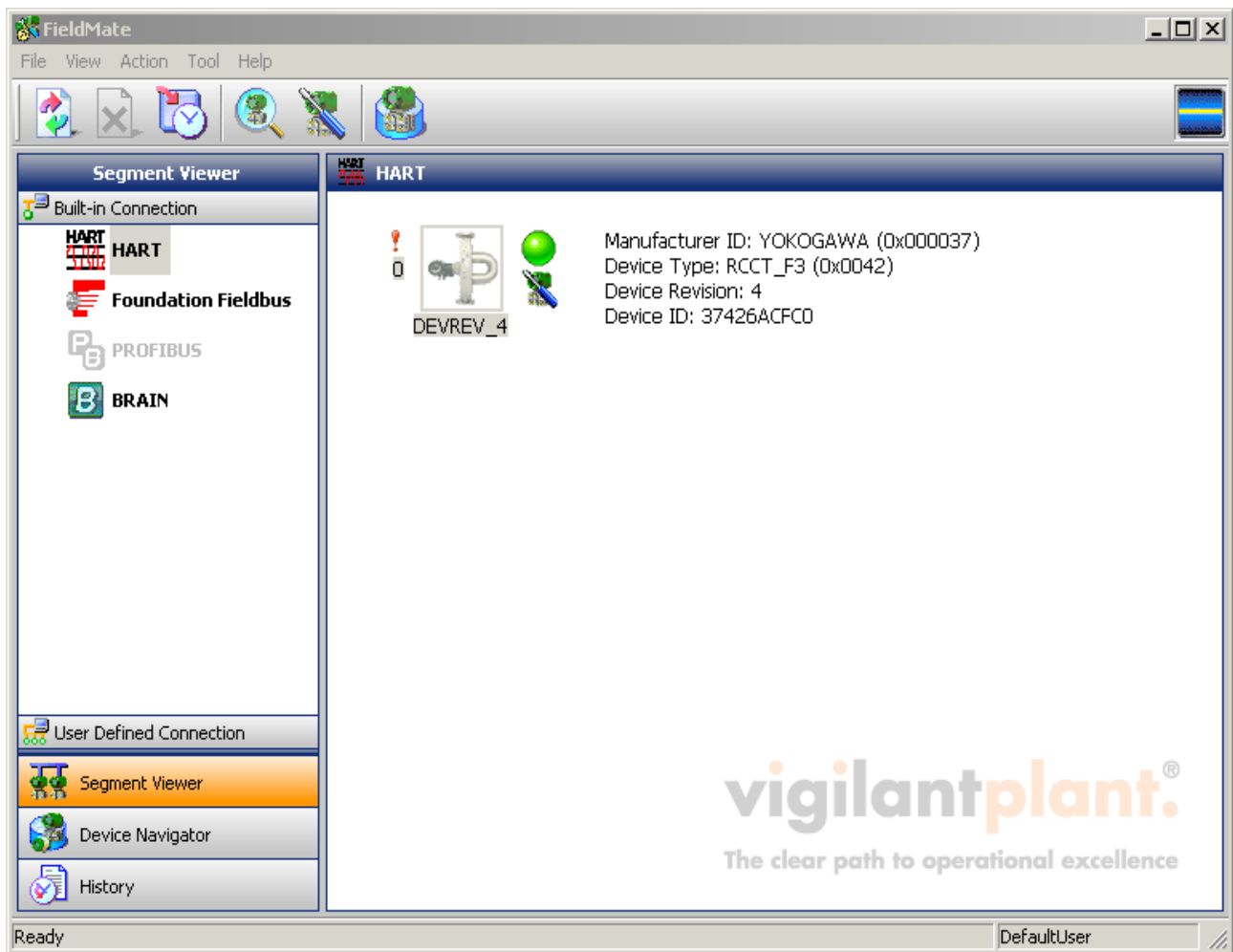
FieldMate is a PC-based flexible field device management tool from Yokogawa.

Features:

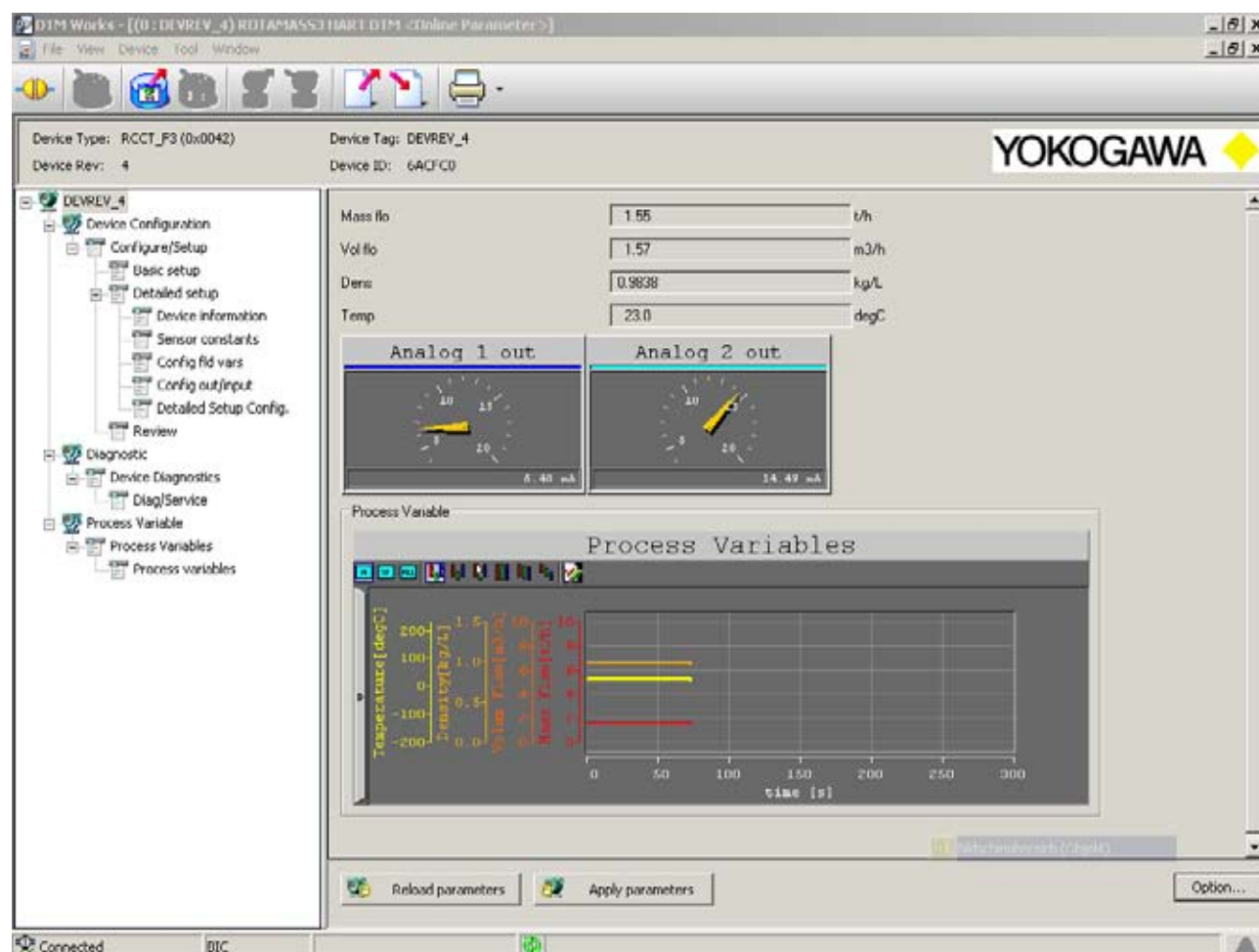
- Instant device recognition upon connection for HART, FF, Profibus and BRAIN devices
- Support of both FDT/DTM and EDDL technologies
- Database support for offline maintenance
- Full history and audit trail
- Synchronization with PRM

The segment viewer will automatically scan the bus and will list your devices.

Fieldmate start window



RCCT_F3 DTM: Start window



6. OPERATION VIA HART

RCCT_F3 DTM: Process variables

The screenshot shows the 'DTM Works' software interface for a 'ROTAMASS3 HART DTM' device. The left sidebar contains a tree view with categories like 'Device Configuration', 'Diagnostic', and 'Process Variable'. The 'Process Variable' category is expanded, showing 'Process Variables' and 'Process variables'. The main area displays a table of process variables with columns for 'View', 'Value', and 'Unit'.

View	Value	Unit
Mass flo	1.55	l/h
Vol flo	1.57	m3/h
Dens	0.9838	kg/L
Temp	23.0	degC
F.Total flow	433.4	kg
R.Total flow	0.0	kg
D.Total flow	434.7	kg
F.Total mass	105040.1	kg
R.Total mass	-0.1	kg
D.Total mass	105044.1	kg
F.Total vol	121.4	m3
R.Total vol	-0.0	m3
D.Total vol	121.4	m3
F.Total energy	1050388.1	MJ
Velocity	1.5495	m/s
Drive gain	10.442	V

Buttons at the bottom include 'Reload parameters', 'Apply parameters', and 'Option...'. The status bar at the bottom shows 'Connected' and 'HART'.

RCCT_F3 DTM: Device information

The screenshot shows the 'DTM Works' software interface for a 'ROTAMASS3 HART DTM' device. The left sidebar contains a tree view with categories like 'Device Configuration', 'Diagnostic', and 'Process Variable'. The 'Device Configuration' category is expanded, showing 'Device Information', 'Sensor constants', 'Config flid vars', 'Config out/input', and 'Detailed Setup Config.'. The 'Device Information' category is selected, showing a table of device information.

Device Info. 1	Device Info. 2
Tag	DEVREV_4
Long Tag	ROTAMASS RCCT36
Descriptor	CORIDUS METER
Message	ROTAMASS HART DTM
Date	2011/3/11
Sensor model	RCCT36
Sensor S/N	0
Final embly num	0
Serial no. converter	01K002043
Serial no. detector	01K002043

Below the table is a photograph of the device. Buttons at the bottom include 'Reload parameters', 'Apply parameters', and 'Option...'. The status bar at the bottom shows 'Connected' and 'HART'.

6.3 Communication via HART Communicator

Keys and functions of HHT 375:



The HART communicator automatically searches for ROTAMASS RCCT_F3 on the 4-20mA loop, when it is turned on. When HART communicator is connected to RCCT_F3, it displays the online menu.

(If RCCT_F3 is not found, it displays "No device found. Press OK...". Press OK 'F4' function key and the main menu appears. Please retry after confirming the connection with RCCT_F3).

If there is no device specific DD installed in the HHT375 (RCCT_F3, Dev v4, DD v1), the functionality of the HART Menu as listed in chapter 7.4 is not total supported.

In this case the HHT375 works in the "Generic Mode", which allows configuring the ROTAMASS with limited functionality.

For upgrading your HHT375 please use "Easy Upgrade" programming utility which is available from EMERSON.

Online Menu Summary

No.	Display item	Contents
1	Device Setup	Set parameters for ROTAMASS
2	PV	Display process value in engineering unit
3	PV AO	Display analog output in mA
4	Review	Review parameters for ROTAMASS
5	Service	Not open

The HART menu in chapter 7.4 shows the configuration of the online menu, which is needed for the operation with HART communicator. Select 'Device Setup' to call up the desired item as follows:

There are two choices to select the desired menu item:

1. Use the ↓ or ↑ key to select the desired item, and then press the → key.
2. Press the number key displayed for the desired item.

To return to the previous display, press the ← key

Entering, setting and sending data:

The data, which is input with the keys is set in the HART-communicator by pressing **ENTER**. Then, by pressing **SEND**, the data is sent to RCCT_F3. Note that the data is not sent to ROTAMASS if **SEND** is not pressed. All the data set with the HART-communicator is held in memory unless power is turned off, so all data can be send to RCCT_F3 in one lot.



IMPORTANT

Parameter setting on the display with the infrared keys is prohibited during HART communication.



IMPORTANT

Do not turn power off just after HART-Communicator settings (sending) have been made. If ROTAMASS is turned off less than 30 seconds after parameters have been set, the set data will not be stored and the data returns to previous settings.

6.4 Unique functions of HART Communicator

Check on communication error:

When over run error, framing error, parity error or buffer overflow error is detected, the data including the information of errors is returned, and the error message is indicated on HHT.

Time recording:

Online → Device setup → Detailed setup → Device information → Date

Month and day can be set in a number of 2 figures, Year in 4 figures.

Multi-drop communication:

Field devices in multi-drop mode refer to the connection of several field devices on a communication single line. Up to 15 field devices can be connected when set in the multi-drop mode.

To activate multi-drop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20 mA output and turns it to 4 mA.

Online → Device setup → Detailed setup → HART Communication → Poll address

Write protect:

Write protect function is provided to inhibit parameter change. That becomes active by entering a password in "New password". Write protect status is released for 10 minutes by entering the password in "Enable wrt 10 min".

Setting the password:

Hotkey → New password

Enter new password to change state of write.

Hotkey → Enable wrt 10 min

"Enable Write" release write protect status for 10 minutes.

While write protect status is released, enter a new password twice, within 30 sec in “New Password”.

It will not be possible to set a new password when 10 minutes have elapsed.

If a parameter, which is write enabled, is changed while the device is in “Enable wrt 10min”, release time is extended for further 10 minutes.



NOTE

- When the write protect function is active (its menu bar shows “Yes”), data setting changes in all parameters of RCCT_F3 are inhibited and cannot be changed using the HART communicator. Also the setting via the infrared pushbuttons is prohibited.
- If 8 characters are input as “space”, the Write protect function is in release status irrespective of time.
- If both RCCT_F3 and HART Communicator power off and on again within 10 minutes after releasing of write protect status, “Enable Write” becomes unavailable.

Software seal :

The “Software seal” menu is reserved as evidence so that user is able to confirm whether the Joker password is used or not. This evidence is saved.

Hotkey → Software seal

The first indication in Software seal menu is ‘keep’.

After the joker password setting it shows ‘break’.

After setting a new password and release via “Enable wrt 10 min”, the Software seal shows “keep” again.

Key Status :

Enable: Infrared keys are activated. Inhibit: Infrared keys are deactivated.

Master Reset :

Default : all parameters set to default except board constants, calibration constants, detector depending parameter and Concentration measuring settings in service menu.

6.5 Transmitting device variables via HART

While current output 1 is connected to a HART master it is possible to transmit up to 4 device variables named primary (PV), secondary (SV), tertiary (TV) and quaternary variable (QV). To select which measurement value will be transmitted in which place there are basically two ways.

• Setting via output configuration

The 4 device variables are linked to the settings of the corresponding output according to the table:

Device variable	Corresponding output (not option /KF2)	Corresponding output (option /KF2)
PV	Current output 1 (Iout 1)	Current output 1 (Iout 1)
SV	Current output 2 (Iout 2)	Not available *)
TV	Pulse output 1 (Pout) *)	Pulse output 1 (Pout) *)
QV	Pulse output 2 (Sout) *)	Not available *)

The unit, in which the device variable is transmitted, is taken from the unit of the corresponding measurement value as shown on the display. To change the order of the device variables, the output configuration has to be changed.

*) If one of the outputs is not available (option /KF2) or Pulse output 1/2 is configured as Status output or No Function, the corresponding device variable can be freely selected via HART output configuration menu (see Chapter 7.15).

• Setting via HART

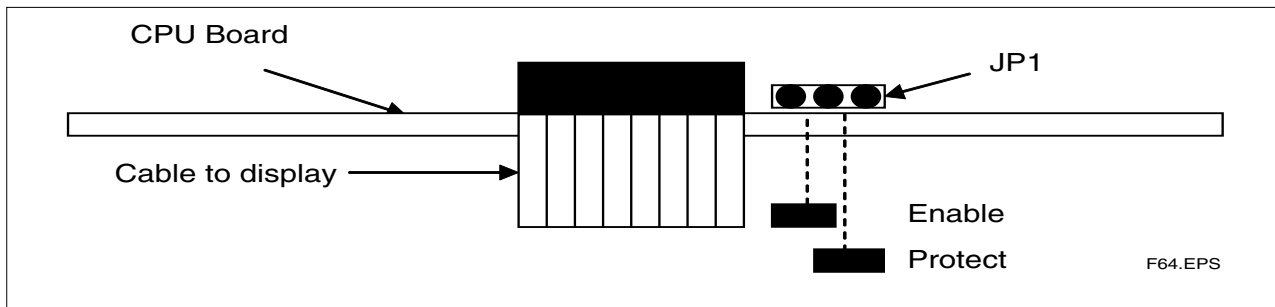
For setting the device variables there are the two common practice commands #51 (assignment of device variables) and #53 (unit of device variables). These commands are typically used by other HART devices like multiplexers.

Since the device variables are linked to the output configuration sending one of this commands will change the output configuration of ROTAMASS!

6.6 Hardware Write Protect

If software write protection via password is not suitable to protect the access to the converter, a hardware write protection can be set:

- Open the cover of the converter.
- Unscrew the 4 screws of the display and move the display aside.
- Set the jumper on JP1 of CPU-board as shown in the following picture.



The activated hard write protection is indicated on display via a lock symbol in the upper right corner (see Chapter 5.1 General display indication).

Screw the display and close the cover.

The hardware write protection is prior to any other write protection, and cannot be released by HART or other software means.

7. PARAMETER DESCRIPTION

7.1 Overview

The table below shows an overview of functions of ROTAMASS RCCT3/RCCF31/RCCR31.
In brackets the related chapters in this manual are indicated.

Topic	Parameters													
Hot key (6.3)	Write Protect HART	Enable wrt 10min. HART	New Password HART	Software seal HART	Key Status HART	Mass flow lowcut	Hardware (6.4)		Mass flow alim 2 sel	Mass flow alim 2 crit	MF fix val sel	Reference density	Density offset	Static pressure control
Mass flow (7.5)	Mass flow unit	Mass flow format	Mass flow LRV	Mass flow URV	Mass flow damping	Mass flow lowcut	Mass flow alim 1 sel	Mass flow alim 1 crit	Mass flow alim 2 sel	Mass flow alim 2 crit	MF fixed value			
Volume flow (7.6)	Vol flow unit	Vol flow format	Vol flow LRV	Vol flow URV	Vol flow damping	Vol flow lowcut	Vol flow alim 1 sel	Vol flow alim 1 crit	Vol flow alim 2 sel	Vol flow alim 2 crit				
Density (7.7)	Density unit	Density format	Density LRV	Density URV	Density damping	Density lowcut	Density alim 1 sel	Density alim 1 crit	Density alim 2 sel	Density alim 2 crit	Density fix val sel	Density	Density offset	Static pressure control
Temperature (7.8)	Temperature unit	Temperature format	Temperature LRV	Temperature URV	Temperature damping	Temperature alim 1 sel	Temperature alim 1 crit	Temperature alim 2 sel	Temperature alim 2 crit	Temperature fix val select	Temperature Gain adjust	Temperature		
Velocity (7.9)	Velocity unit													
Analog Output 1 (7.10)	Analog 1 select	Analog 1 alarm out	Analog 1 low LMT	Analog 1 high LMT										
Analog Output 2 (7.11)	Analog 2 select	Analog 2 alarm out	Analog 2 low LMT	Analog 2 high LMT										
Pulse/Status out 1 (7.12)	Pulse/Stat 1 select	Pulse 1 select	Pulse 1 unit	Pulse 1 rate	Pulse 1 active mode	Pulse 1 width	Pulse 1 at alarm	SO1 function	SO1 active mode					
Pulse/Status out 2 (7.13)	Pulse/Stat 2 select	Pulse 2 select	Pulse 2 unit	Pulse 2 rate	Pulse 2 active mode	Pulse 2 width	Pulse 2 at alarm	SO2 function	SO2 active mode					
Status input (7.14)	SI function	SI active mode												
HART Output (7.15)	PV is	SV is	TV is	QV is										
Totalizer (7.16)	Total flex select	Total flex unit	Total mass unit	Total volume unit	Total net unit	Total energy unit	Heat of combustion	Heat of combustion unit	Total switch select	Total limit switch	Total at alarm	Total reset cntl	Total reset	
Display (5)	Display select	Disp. contrast	Dips. period	Language										
Diag/Service (8)	Self test/status (8.3)	Input/Output Test (8.4)	Zero adjustment (5.6)	Autozero (7.24)	Output trim (8.5)	History overview (8.2)	Error history (8.2)							
Special functions	Flow direction (7.17)	Concentration measurement (7.18)	Net flow (7.19)	Slug detection (7.20)	Empty pipe detection (7.21)	Corrosion detection (7.22)	Fluid max. Temp. (7.25)	Gas measurement (7.26)						
Detector data (7.23)	Sensor model	Sensor constants	Sensor S/N											
Device data	Distributor	Tag	Long Tag	Descriptor	Message	Date	Dev id	Universal rev	Fid dev rev	Software rev	Hardware rev	Device SW version	Device SW date	
HART data	Poll address	Num req preams	Num resp preams	Master reset										

Differences between display and HART setting

The ROTAMASS software is continuously improved. This leads to functions, which are different in HART (DD version 0401) and display setting (software version from 1.08.00)

7.2 Parameter list

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Write protect	Select	No	-	-	R/W			-
		Yes						
Enable WRT 10 min		Acc. To HART	-	-	R/W	X		Disable
New Password	ASCII	8 characters	-	-	R/W	X		Space
Software Seal	Select	Break	-	-	R/W			-
		Keep						
Master reset	Select	Not Execute	-	-	R/W	X		Not Execute
		Execute						
Key Status	Select	Enable	-	-	R/W			Enable
		Inhibit						
Language	Select	English	-	-	R/W	X		English
		German						
		French						
		Russian						
Mass Flow	Decimal	-	0 to 5	Mass flow unit	R		-	-
Volume Flow	Decimal	-	0 to 5	Vol flow unit	R		-	-
Density	Decimal	-	0 to 5	Density unit	R		-	-
Temperature	Decimal	-	0 to 5	Temperature unit	R		-	-
F-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
R-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
D-Total flex	Decimal	-	Auto	Total flex unit	R	X	-	-
F-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
R-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
D-Total mass	Decimal	-	Auto	Total mass unit	R	X	-	-
F-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
R-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
D-Total vol	Decimal	-	Auto	Total volume unit	R	X	-	-
F-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
R-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
D-Total net	Decimal	-	Auto	Total net unit	R	X	-	-
Concentration meas	Decimal	0 to 110	0 to 5	Concentration meas unit	R		-	-
Net flow	Decimal	-	0 to 5	Mass flow unit	R		-	-
F-Total energy	Decimal	-	Auto	Total unit energy	R	X	-	-
Velocity	Decimal	-	Auto	Velocity unit	R		-	-
Drive gain	Decimal	0 to 11 (typ.)	3	V	R		-	-
Analog output 1	Decimal	-	As sel. Var.	As sel. Var.	R		-	-
Analog output 1%	Decimal	-	2	%	R		-	-

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Analog output 1 mA	Decimal	-	2	mA	R		-	-
Analog output 2	Decimal	-	as sel. Var.	as sel. Var.	R		-	-
Analog output 2%	Decimal	-	2	%	R		-	-
Analog output 2 mA	Decimal	-	2	mA	R		-	-
Pulse output 1	Decimal	-	1	Hz	R		-	-
Status output 1	ASCII	-	-	-	R		-	-
Pulse output 2	Decimal	-	1	Hz	R		-	-
Status output 2	ASCII	-	-	-	R		-	-
View input	ASCII	-	-	-	R		-	-
Self Test	Select	Not Execute Execute	-	-	R/W		X	Not Execute
Status	ASCII	Results of last self test	-	-	R		-	-
Hist Overview ord	ASCII	-	-	-	R		-	-
Hist Overview abs	ASCII	-	-	-	R		-	-
Error History	ASCII	-	-	-	R		-	-
Analog output 1 (Test)	Decimal	2.0 to 22.0	2	mA	W	X	X	4
Analog output 2 (Test)	Decimal	2.0 to 22.0	2	mA	W	X	X	4
Pulse output 1 (Test)	Decimal	0 to 10000	1	Hz	W	X	X	1000
Status Output 1 (Test)	Select	On Active Off Active	-	-	W	X	X	On Active
Pulse output 2 (Test)	Decimal	0 to 10000	1	Hz	W	X	X	1000
Status Output 2 (Test)	Select	On Active Off Active	-	-	W	X	X	On Active
Status input (Test)	ASCII	Open/Short	-	-	R		-	-
Autozero tuning	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Autozero Time	Select	3 min 30 s	-	-	R/W	X	X	3 min
Autozero Exe	Select	Not Execute Execute	-	-	Exe	X	X	Not Execute
Autozero Value	Decimal	depends on size	3	kg/h	R	X		0
Autozero History	ASCII	-	-	-	R	X	-	-
Autozero initial	Decimal	depends on size	3	kg/h	R	X	-	-
Autozero range	Decimal	depends on size	3	kg/h	R		-	-
Autozero fluctuation range	Decimal	depends on size	3	kg/h	R	X	-	-
Output Trim AO 1 trim 4mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 2 trim 4mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 1 trim 20mA	Decimal	ACC To HART	-	-	R/W		-	0
Output Trim AO 2 trim 20mA	Decimal	ACC To HART	-	-	R/W		-	0
Tag	ASCII	8 characters	-	-	R/W			Space
Long Tag	ASCII	22 characters	-	-	R/W			Space

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp select 1	Select	Mass flow	-	-	R/W	X		Mass flow
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
Disp select 2	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp select 3	Select	Mass flow	-	-	R/W	X		Temperature
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						
Disp select 4	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
		None						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Disp contrast	Select	-5 -4 -3 -2 -1 0 1 2 3 4 5	-	-	R/W	X		0
Disp Period	Select	0.5 s 1.0 s 2.0 s	-	-	R/W	X		1.0 s
Flow direction	Select	Forward Reverse	-	-	R/W	X		Forward
Mass flow unit	Select	g/s g/min g/h kg/s kg/min kg/h kg/d t/min t/h t/d lb/s lb/min lb/h lb/d	-	-	R/W	X		RCCS30...33 kg/h RCCS34...39XR t/h
Mass flow format	Select	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	-	-	R/W	X		xxxx.XX
Mass flow LRV	Decimal	-Qmax to Qmax	0 to 5	Mass flow unit	R/W	X		0
Mass flow URV	Decimal	-Qmax to Qmax	0 to 5	Mass flow unit	R/W	X		Qnom
Mass flow damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Mass flow lowcut	Decimal	0 to 10% of Qmax	0 to 5	Mass flow unit	R/W	X		0
Mass flow alm 1 sel	Select	No function More than Less than	-	-	R/W	X		No function
Mass flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Mass flow unit	R/W	X		0
Mass flow alm 2 sel	Select	No function More than Less than	-	-	R/W	X		No function
Mass flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Mass flow unit	R/W	X		10
Mass flow fix val sel	Select	Inhibit Enable	-	-	R/W	X		Inhibit
Mass flow fixed val	Decimal	0 to Qnom	0 to 5	Mass flow unit	R/W	X		0

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Vol flow unit	Select	cm³/s	-	-	R/W	X		RCCS30...33 l/h
		cm³/min						RCCS34...39XR m³/h
		cm³/h						
		l/s						
		l/min						
		l/h						
		l/d						
		m³/s						
		m³/min						
		m³/h						
		m³/d						
		gal/s						
		gal/min						
		gal/h						
		gal/d						
		Cuft/s						
		Cuft/min						
		Cuft/h						
		Cuft/d						
		bbl/s						
		bbl/min						
		bbl/h						
		bbl/d						
		Impgal/s						
		Impgal/min						
		Impgal/h						
		Impgal/d						
		l(N)/s						
		l(N)/min						
		l(N)/h						
		l(N)/d						
		m³(N)/s						
		m³(N)/min						
		m³(N)/h						
		m³(N)/d						
		Sl/s						
		Sl/min						
		Sl/h						
		Sl/d						
		Scuft/s						
		Scuft/min						
		Scuft/h						
		Scuft/d						
		Sm³/s						
		Sm³/min						
		Sm³/h						
		Sm³/d						
Vol flow format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Vol flow LRV	Decimal	-Qvmax to Qvmax	0 to 5	Vol flow unit	R/W	X		0
Vol flow URV	Decimal	-Qvmax to Qvmax	0 to 5	Vol flow unit	R/W	X		Qvnom
Vol flow damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Vol flow lowcut	Decimal	0 to 10% of Qvmax	0 to 5	Vol flow unit	R/W	X		0
Vol flow alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Vol flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Vol flow unit	R/W	X		0
Vol flow alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Vol flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Vol flow unit	R/W	X		10
Density unit	Select	g/ml	-	-	R/W	X		kg/l
		kg/l						
		kg/m³						
		lb/gal						
		lb/Cuft						
		g/cm³						
		g/l						
		°Bé hv						
		°Bé lt						
		°API						
Density format	Select	xxxxxxx	-	-	R/W	X		xx.XXXX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Density LRV	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		0.0
Density URV	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		1.5
Density damping	Decimal	0 to 200	1	Sec.	R/W	X		15.0
Density lowcut	Decimal	0 to 0.5 kg/l	0 to 5	Density unit	R/W	X		0.0
Density alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Density alm1 crit	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		LRV
Density alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Density alm 2 crit	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		URV
Density fix val sel	Select	Inhibit	-	-	R/W	X		Inhibit
		Enable						
Reference Density	Decimal	0 to 5 kg/l	0 to 5	Density unit	R/W	X		1.0
Density offset	Decimal	-9999.99 to +9999.99	2	g/l	R/W	X		0
Pressure	Decimal	0 to 400	2	bar	R/W			0
Pressure unit	Select	bar	-	-	R/W			bar
		psi						
		MPa						
Temperature unit	Select	degC	-	-	R/W	X		degC
		degF						
		K						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Temperature format	Select	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	-	-	R/W	X		xxxxxx.X
Temperature LRV	Decimal	Standard: -200 to 230°C High Temp.: 0 to 400°C	0 to 5	Temperature unit	R/W	X		-200
Temperature URV	Decimal	Standard: -200 to 230°C High Temp.: 0 to 400°C	0 to 5	Temperature unit	R/W	X		230
Temperature damping	Decimal	0 to 200	1	Sec.	R/W	X		3
Temp alm 1 sel	Select	No function More than Less than	-	-	R/W	X		No function
Temp alm 1 crit	Decimal	Standard: -200 to 200°C	0 to 5	Temperature unit	R/W	X		LRV
Temp alm 2 sel	Select	No function More than Less than	-	-	R/W	X		No function
Temp alm 2 crit	Decimal	Standard: -200 to 230°C High Temp.: 0 to 400°C	0 to 5	Temperature unit	R/W	X		URV
Temp fix val select	Select	Inhibit Enable	-	-	R/W	X	X	Inhibit
Temp fixed val	Decimal	Standard: -200 to 230°C High Temp.: 0 to 400°C	1	Temperature unit	R/W	X	X	30
Temp gain	Decimal	0.8 to 1.2	3	-	R/W			1
Velocity unit	Select	m/s ft/s	-	-	R/W	X		m/s
Analog 1 select	Select	Mass flow Volume flow Density Temperature Concentration meas Net flow None	-	-	R/W	X		Mass flow
Analog 1 alarm out	Select	<2.4mA <3.6mA 4.0mA >21mA >21.6mA Hold Measured Value	-	-	R/W	X		<3.6mA
Analog 1 low LMT	Decimal	NAMUR:3.8 to 20.5 mA Not NAMUR:2.4 to 21.6 mA	2	mA	R/W	X		3.8 (Namur); 2.4 (not Namur)
Analog 1 high LMT	Decimal	NAMUR:3.8 to 20.5 mA Not NAMUR:2.4 to 21.6 mA	2	mA	R/W	X		20.5 (Namur); 21.6 (not Namur)

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Analog 2 select	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
Analog 2 alarm out	Select	<2.4mA	-	-	R/W	X		<3.6mA
		<3.6mA						
		4.0mA						
		>21mA						
		>21.6mA						
		Hold						
		Measured Value						
Analog 2 low LMT	Decimal	NAMUR:3.8 to 20.5 mA	2	mA	R/W	X		3.8 (Namur);
		Not NAMUR:2.4 to 21.6 mA						2.4 (not Namur)
Analog 2 high LMT	Decimal	NAMUR:3.8 to 20.5 mA	2	mA	R/W	X		20.5 (Namur);
		Not NAMUR:2.4 to 21.6 mA						21.6 (not Namur)
Pulse/Stat 1 select	Select	Pulse	-	-	R/W	X		Pulse
		Status out						
		No function						
Pulse 1 select	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration						
		Net flow						
		None						
		F-Total mass						
		R-Total mass						
		F-Total volume						
		R-Total volume						
		F-Total net						
		R-Total net						
Pulse 1 unit	Select	Hz	-	-	R/W	X		kg/P
		g/P						
		kg/P						
		t/P						
		lb/P						
		cm³/P						
		l/P						
		m³/P						
		gal/P						
		kgal/P						
		Cuft/P						
		bbl/P						
		Impgal/P						
		klmpgal/P						
		l(N)/P						
		m³(N)/P						
		Sl/P						
		Scuft/P						
		Sm³/P						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Pulse 1 rate	Decimal	0 to 11000 Unit/ P 0 to 10000 Hz	0 to 5 0	Pulse 1 unit	R/W	X		1 kg/P
Pulse 1 active mode	Select	On Active Off Active	-	-	R/W	X		On Active
Pulse 1 width	Select	0.05ms 0.1ms 0.5ms 1ms 5ms 10ms 50ms 100ms 500ms 1000ms	-	-	R/W	X		1ms
Pulse 1 at alarm	Select	0P/0Hz Measured Value Hold	-	-	R/W	X		0P/Hz
SO 1 function	Select	No function Flow-Direction Total switch Mass flow alm 1 Mass flow alm 2 Mass flow alm 1+2 Vol flow alm 1 Vol flow alm 2 Vol flow alm 1+2 Density alm 1 Density alm 2 Density alm 1+2 Temp alm 1 Temp alm 2 Temp alm 1+2 Concentr. meas alm 1 Concentr. meas alm 2 Concentr. meas alm 1+2 Net flow alm 1 Net flow alm 2 Net flow alm 1+2 Slug alarm Empty alarm Corrosion alarm All alarms All errors All alarms & errors	-	-	R/W	X		No function
SO 1 active mode	Select	On Active Off Active	-	-	R/W	X		On Active
Pulse/Stat 2 select	Select	Pulse Status out No function	-	-	R/W	X		Status out

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Pulse 2 select	Select	Mass flow Volume flow Density Temperature Concentration Net flow None F-Total mass R-Total mass F-Total volume R-Total volume F-Total net R-Total net	-	-	R/W	X		Temperature
Pulse 2 unit	Select	Hz g/P kg/P t/P lb/P cm³/P l/P m³/P gal/P kgal/P Cuft/P bbl/P Impgal/P klmpgal/P l(N)/P m³(N)/P Sl/P Scuft/P Sm³/P	-	-	R/W	X		Hz
Pulse 2 rate	Decimal	0 to 11000 Unit/P 0 to 2000 Hz	0 to 5 0	Pulse 2 unit	R/W	X		2000 Hz
Pulse 2 active mode	Select	On Active Off Active	-	-	R/W	X		On Active
Pulse 2 width	Select	0.05ms 0.1ms 0.5ms 1ms 5ms 10ms 50ms 100ms 500ms 1000ms	-	-	R/W			1ms
Pulse 2 at alarm	Select	0P/0Hz Measured Value Hold	-	-	R/W	X		0P/0Hz

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
SO 2 function	Select	No function	-	-	R/W	X		No Function
		Flow-Direction						
		Total switch						
		Mass flow alm 1						
		Mass flow alm 2						
		Mass flow alm 1+2						
		Vol flow alm 1						
		Vol flow alm 2						
		Vol flow alm 1+2						
		Density alm 1						
		Density alm 2						
		Density alm 1+2						
		Temp alm 1						
		Temp alm 2						
		Temp alm 1+2						
		Concentr. meas alm 1						
		Concentr. meas alm 2						
		Concentr. meas alm 1+2						
		Net flow alm 1						
		Net flow alm 2						
		Net flow alm 1+2						
		Slug alarm						
		Empty alarm						
		Corrosion alarm						
		All alarms						
		All errors						
		All alarms & errors						
SO 2 active mode	Select	On active	-	-	R/W	X		On active
		Off active						
PV is	Select	Mass flow	-	-	R/W	X		Mass flow
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
SV is	Select	Mass flow	-	-	R/W	X		Density
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
TV is	Select	Mass flow	-	-	R/W	X		F-Total mass
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
QV is	Select	Mass flow	-	-	R/W	X		Temperature
		Volume flow						
		Density						
		Temperature						
		Concentration meas						
		Net flow						
		None						
		F-Total flex						
		R-Total flex						
		D-Total flex						
		F-Total mass						
		R-Total mass						
		D-Total mass						
		F-Total volume						
		R-Total volume						
		D-Total volume						
		F-Total net						
		R-Total net						
		D-Total net						
		F-Total energy						
		Velocity						
		Drive gain						
SI function	Select	No function	-	-	R/W	X		No function
		Autozero						
		Reset flex totals						
		Reset mass totals						
		Reset volume totals						
		Reset net totals						
		Reset all totals						
		0% Signal lock						
SI Active mode	Select	On active	-	-	R/W	X		On Active
		Off active						
Total flex select	Select	Flex total	-	-	R/W	X		Flex total
		Mass total						
		Volume total						
		Net total						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Total flex unit	Select	g kg t lb cm ³ l m ³ gal kgal Cuft bbl Impgal klmpgal l(N) m ³ (N) Sl Scuft MMscuft Sm ³	-	-	R/W	X		kg
Total mass unit	Select	g kg t lb	-	-	R/W	X		kg
Total volume unit	Select	cm ³ l m ³ gal kgal Cuft bbl Impgal klmpgal l(N) m ³ (N) Sl Scuft MMscuft Sm ³	-	-	R/W	X		l
Total net unit	Select	g kg t lb cm ³ l m ³ gal kgal Cuft bbl Impgal klmpgal	-	-	R/W	X		kg
Total switch select	Select	Mass Volume Net	-	-	R/W	X		Mass

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Total limit switch	Decimal	0 to 9999999	0 to 5	Total unit	R/W	X		0
Total unit energy	Select	MJ Btu	-	-	R/W	X		MJ
Energy factor/ heat of combustion	Decimal	0 to 100000	0 to 5	heat of combust unit	R/W			10
Energy factor/ heat of combust unit	Select	MJ/kg Btu/lb MJ/m³(N) Btu/Scuft	-	-	R/W	X		MJ/kg
Total at alarm	Select	Hold Continue Total	-	-	R/W	X		Hold
Total reset cntrl	Select	Inhibit Enable	-	-	R/W	X		Inhibit
Total reset	Select	Not Execute Reset flex totals Reset mass totals Reset volume totals Reset net totals Reset all totals	-	-	R/W	X	X	Not Execute
SK20	Decimal		0 to 5	MHz×kg/h	R/W			124
SKT	Decimal		0 to 5	E-4×1/K	R/W			-7,34
SKTK	Decimal		0 to 5	E-7×1/K²	R/W			19,6
RV	Decimal		0 to 5	%/(kg/l)	R/W			0,24
Qnom	Decimal		auto	Mass flow unit	R			10
KD	Decimal		0 to 5	kg/l	R/W			4,4
f120	Decimal		0 to 5	Hz	R/W			177,1
FTC1	Decimal		0 to 5	E-4×1/K	R/W			-2,179
FTCK	Decimal		0 to 5	E-7×1/K²	R/W			-0,539
SKP	Decimal		0 to 5	E-4×1/bar	R/W			-0,346
SKPT	Decimal		0 to 5	E-7×1/(bar×K)	R/W			0
FPC	Decimal		0 to 5	E-4×1/bar	R/W			0,173
FPTC	Decimal		0 to 5	E-7×1/(bar×K)	R/W			0,02
FQC1	Decimal		0 to 5	E-10×s/g	R/W			0
FQC2	Decimal		0 to 5	E-13×(s/g)²	R/W			-40,8
Poll Adress	Decimal	0 to 15	0	-	R/W			0
Num req pream	Decimal		0	-	R			5
Num resp pream	Decimal	5 to 20	0	-	R/W			5
Reference temperature	Decimal		1	Temperature unit	R/W	X		25
Ref. density carrier	Decimal		0 to 5	Density unit	R/W	X		0,997
Temp. coeff. a carrier	Decimal		0 to 5	E-3×(1/Temp unit)	R/W	X		-0,261
Temp. coeff. b carrier	Decimal		0 to 5	E-5×(1/Temp unit²)	R/W	X		-0,36
Ref. density product	Decimal		0 to 5	Density unit	R/W	X		0
Temp. coeff. a product	Decimal		0 to 5	E-3×(1/Temp unit)	R/W	X		0
Temp. coeff. b product	Decimal		0 to 5	E-5×(1/Temp unit²)	R/W	X		0
Concentration meas unit	Select	°Brix Wt % sol Vol % sol Wt % Vol %	-	-	R/W	X X X X X		Wt-%

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Concentration meas format	Select	xxxxxxx xxxxx.X xxxx.XX xxx.XXX xx.XXXX x.XXXXX	-	-	R/W	X X X X X X		xxxx.XX
Concentration meas LRV	Decimal	0 to 110	0 to 5	Concentration meas unit	R/W	X		0
Concentration meas URV	Decimal	0 to 110	0 to 5	Concentration meas unit	R/W	X		100
Concentration meas Damp	Decimal	0 to 200	1	Sec	R/W	X		10
Concentration meas lowcut	Decimal	0 to 10%	0 to 5	Concentration meas unit	R/W			0
Conc meas alm 1 sel	Select	No function More than Less than	-	-	R/W	X		No function
Conc meas alm 1 crit	Decimal	0 to 110% of URV	0 to 5	Concentration meas unit	R/W	X		LRV
Conc meas alm 2 sel	Select	No function More than Less than	-	-	R/W	X		No function
Conc meas alm 2 crit	Decimal	0 to 110% of URV	0 to 5	Concentration meas unit	R/W	X		URV
Net flow select	Select	Mass Volume	-	-	R/W	X		Mass

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Net flow unit	Select	g/s	-	-	R/W	X		RCCS30...33 kg/h RCCS34...39/ XR t/h
		g/min						
		g/h						
		kg/s						
		kg/min						
		kg/h						
		t/min						
		t/h						
		lb/s						
		lb/min						
		lb/h						
		cm³/s						
		cm³/min						
		cm³/h						
		l/s						
		l/min						
		l/h						
		l/d						
		m³/s						
		m³/min						
		m³/h						
		m³/d						
		gal/s						
		gal/min						
		gal/h						
		gal/d						
		Cuft/s						
		Cuft/min						
		Cuft/h						
		Cuft/d						
		bbl/s						
		bbl/min						
		bbl/h						
		bbl/d						
		Impgal/s						
		Impgal/min						
		Impgal/h						
		Impgal/d						
Net flow format	Select	xxxxxxx	-	-	R/W	X		xxxx.XX
		xxxxx.X						
		xxxx.XX						
		xxx.XXX						
		xx.XXXX						
		x.XXXXX						
Net flow LRV	Decimal	-Qmax to Qmax	0 to 5	Net flow unit	R/W	X		0
Net flow URV	Decimal	-Qmax to Qmax	0 to 5	Net flow unit	R/W	X		Qnom
Net flow damping	Decimal	0 to 200	1	Sec	R/W	X		3
Net flow lowcut	Decimal	0 to 10% of Qmax	0 to 5	Net flow unit	R/W	X		0.0
Net flow alm 1 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						

7. PARAMETER DESCRIPTION

Parameter	Data form	Data range	Dec. point	Unit	R : read W : write Exe : execute	Reset Master	Reset Power on	Default
Net flow alm 1 crit	Decimal	-110% to 110% of URV	0 to 5	Net flow unit	R/W	X		LRV
Net flow alm 2 sel	Select	No function	-	-	R/W	X		No function
		More than						
		Less than						
Net flow alm 2 crit	Decimal	-110% to 110% of URV	0 to 5	Net flow unit	R/W	X		URV
Measuring range	Select	Namur	-	-	R			Namur
		Not Namur						
Slug alarm select	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Drive gain	Decimal	0 to 11 (typ.)	3	V	R			-
Slug criteria	Decimal	0 to 13.3	3	V	R/W	X		11
Slug duration	Decimal	0 to 120	0	Sec.	R/W	X		1
After slug	Select	Measured value	-	-	R/W	X		Measured value
		Hold						
Drive gain damping	Decimal	0 to 200	1	Sec.	R/W	X		1
Empty pipe alm sel	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Empty pipe crit	Decimal	0 to Density URV	0 to 5	Density unit	R/W	X		0
After empty pipe	Select	Massflow=Zero	-	-	R/W	X		Massflow=
		Measured value						Zero
		Hold						
Corrosion alm sel	Select	Not Apply	-	-	R/W	X		Not Apply
		Apply						
Corrosion criteria	Decimal	0 to Density URV	0 to 5	Density unit	R/W	X		1,5
Corrosion damp	Decimal	0 to 10	1	h	R/W	X		10
Fluid max temp	Decimal	-	1	Temperature unit	R			-
Distributor	ASCII	-	-	-	R			Yokogawa
Descriptor	ASCII	16 characters	-	-	R/W			Space
Message	ASCII	32 characters	-	-	R/W			Space
Date	ASCII	dd/mm/yyyy	-	-	R/W			01/01/2011
Sensor model	Select	RCCS30	-	-	R/W			RCCS36
		RCCS31						
		RCCS32						
		RCCS33						
		RCCS34						
		RCCS36						
		RCCS38						
		RCCS39						
		RCCS39/IR						
		RCCS39/XR						
Sensor S/N	Decimal	7 digits	-	-	R			0 (not used)
Assembly number	Decimal	7 digits	-	-	R			0 (not used)
Serial no. Converter	ASCII	16 char.	-	-	R			fix
Serial no. Detector	ASCII	16 char.	-	-	R			fix
Universal rev	Decimal	7 digits	-	-	R			fix
Fld. dev rev.	Decimal	3 digits	-	-	R			fix
Software rev	Decimal	3 digits	-	-	R			fix
Hardware rev	Decimal	3 digits	-	-	R			fix
Device id	Decimal	7 digits	-	-	R			7xxxxxx
Device S/W version	ASCII	20 char.	-	-	R			RCCT3 Vx.xx. xx Rx-x-x
Device S/W date	ASCII	dd/mm/yyyy	-	-	R			xx/xx/xxxx

7.3 Parameter tree, Display menu

Language	English
	German
	French
	Russian

Process Variables	View fld dev vars	Mass flow		R	
		Volume flow		R	
		Density		R	
		Temperature		R	
		Concentration meas		R	
		Net flow		R	
		F-Total flex		R	
		R-Total flex		R	
		D-Total flex		R	
		F-Total mass		R	
		R-Total mass		R	
		D-Total mass		R	
		F-Total volume		R	
		R-Total volume		R	
		D-Total volume		R	
		F-Total net		R	
		R-Total net		R	
		D-Total net		R	
		F-Total energy		R	
		Velocity		R	
		Drive gain		R	
	View outputs	Analog output 1	Analog Output 1	R	
			Analog Output 1%	R	
			Analog Output 1mA	R	
		Analog output 2	Analog Output 2	R	
			Analog Output 2%	R	
			Analog Output 2mA	R	
		Pulse/Status out 1	Pulse output 1	R	
			Status output 1	R	
		Pulse/Status out 2	Pulse output 2	R	
			Status output 2	R	
	View input			R	
	Totalizer	Total reset cntrl	Inhibit	Sel	
			Enable		
			Total reset	Not Execute	
				Reset flex totals	EXE
				Reset mass totals	EXE
				Reset volume totals	EXE
				Reset net totals	EXE
				Reset all totals	EXE

7. PARAMETER DESCRIPTION

Diag/Service	Self test/Status	Self Test	LCD Test	EXE
			Self Test	EXE
			Key Test	EXE
		Status	Event Overview	R
			Error	R
			Alarm	R
			Warning	R
		Hist Overview ord	Hist Overview ord	R
			Clear History	EXE
		Hist Overview abs	Hist Overview abs	R
			Error	R
			Alarm	R
			Warning	R
			Clear History	EXE
		Error History		R
	Input/Output test	Analog output 1		R/W
		Analog output 2		R/W
		Pulse output 1		R/W
		Status output 1		R/W
		Pulse output 2		R/W
		Status output 2		R/W
		Status input		R
	Auto zero check	Autozero history		R
		Autozero initial		R
		Autozero range		R
		Autozero fluctuation range		R
	Autozero	Zero tuning	Inhibit	Sel
			Enable	
		Autozero time	3min	Sel
			30s	
		Autozero Exe		EXE
		Autozero value		R
	Output trim	AO 1 trim 4mA		EXE
		AO 1 trim 20mA		EXE
		AO 2 trim 4mA		EXE
		AO 2 trim 4mA		EXE

7. PARAMETER DESCRIPTION

Basic Setup	Tag			R/W
	Long Tag			R/W
	Display config	Disp select 1	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
		Disp select 2	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

7. PARAMETER DESCRIPTION

Basic Setup		Disp select 3	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	
		Disp select 4	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

Basic Setup

Display contrast	-5
	-4
	-3
	-2
	-1
	0
	+1
	+2
	+3
	+4
	+5

Sel

Mass flow	Mass flow unit	g/s
		g/min
		g/h
		kg/s
		kg/min
		kg/h
		kg/d
		t/min
		t/h
		t/d
		lb/s
		lb/min
		lb/h
		lb/d

Sel

Mass flow LRV
Mass flow URV
Mass flow damping

R/W

R/W

R/W

Density	Density unit	g/ml
		kg/l
		kg/m ³
		lb/gal
		lb/Cuft
		g/cm ³
		g/l
		°Bé hv
		°Bé lt
		°API

Sel

Density LRV
Density URV
Density damping

R/W

R/W

R/W

7. PARAMETER DESCRIPTION

Basic Setup	Temperature	Temperature unit	degC	Sel
			degF	
			K	
		Temperature LRV		R/W
		Temperature URV		R/W
		Temperature damping		R/W
	Analog 1 select	Mass flow		Sel
		Volume flow		
		Density		
		Temperature		
		Concentration meas		
		Net flow		
		None		
	Analog 2 select	Mass flow		Sel
		Volume flow		
		Density		
		Temperature		
		Concentration meas		
		Net flow		
		None		
	Pulse/Status out 1	Pulse/Stat 1 select	Pulse	Sel
			Status Out	
			No Function	
		Pulse 1 select	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	

Basic Setup

Pulse 1 unit	Hz
	g/P
	kg/P
	t/P
	lb/P
	cm ³ /P
	l/P
	m ³ /P
	gal/P
	kgal/P
	Cuft/P
	bbl/P
	Impgal/P
	kImpgal/P
	l(N)/P
	m ³ (N)/P
	Sl/P
	Scuft/P
	Sm ³ /P
Pulse 1 rate	
SO 1 function	No Function
	Flow direction
	Total switch
	Mass flow alm 1
	Mass flow alm 2
	Mass flow alm 1+2
	Vol flow alm 1
	Vol flow alm 2
	Vol flow alm 1+2
	Density alm 1
	Density alm 2
	Density alm 1+2
	Temp alm 1
	Temp alm 2
	Temp alm 1+2
	Concentr. meas alm 1
	Concentr. meas alm 2
	Concentr. meas alm 1+2
	Net flow alm 1
	Net flow alm 2
	Net flow alm 1+2
	Slug Alarm
	Empty alarm
	Corrosion Alarm
	All alarms
	All errors
	All alarms & errors

Sel

R/W

Sel

7. PARAMETER DESCRIPTION

Basic Setup	Pulse/Status out 2	Pulse/Stat 2 select	Pulse	Sel
			Status Out	
			No Function	
		Pulse 2 select	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	
		Pulse 2 unit	Hz	Sel
			g/P	
			kg/P	
			t/P	
			lb/P	
			cm ³ /P	
			l/P	
			m ³ /P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			l(N)/P	
			m ³ (N)/P	
			Sl/P	
			Scuft/P	
			Sm ³ /P	
		Pulse 2 rate		R/W

Basic Setup

SO 2 function	No Function
	Flow direction
	Total switch
	Mass flow alm 1
	Mass flow alm 2
	Mass flow alm 1+2
	Vol flow alm 1
	Vol flow alm 2
	Vol flow alm 1+2
	Density alm 1
	Density alm 2
	Density alm 1+2
	Temp alm 1
	Temp alm 2
	Temp alm 1+2
	Concentr. meas alm 1
	Concentr. meas alm 2
	Concentr. meas alm 1+2
	Net flow alm 1
	Net flow alm 2
	Net flow alm 1+2
	Slug Alarm
	Empty alarm
	Corrosion Alarm
	All alarms
	All errors
	All alarms & errors

Sel

SI function	No function
	Autozero
	Reset flex totals
	Reset mass totals
	Reset volume totals
	Reset net totals
	Reset all totals
	0% signal lock

Sel

Totalizer	Total flex select	Mass
		Volume
		Net

Sel

7. PARAMETER DESCRIPTION

Basic Setup	Total flex unit		Sel
		g	
		kg	
		t	
		lb	
		cm ³	
		l	
		m ³	
		gal	
		kgal	
		Cuft	
		bbl	
		Impgal	
		KImpgal	
		l(N)	
		m ³ (N)	
		Sl	
		Scuft	
		MMscuft	
		Sm ³	
	Total mass unit		Sel
		g	
		kg	
		t	
		lb	
	Total volume unit		Sel
		cm ³	
		l	
		m ³	
		gal	
		kgal	
		Cuft	
		bbl	
		Impgal	
		KImpgal	
		l(N)	
		m ³ (N)	
		Sl	
		Scuft	
		MMscuft	
		Sm ³	

Basic Setup				Total net unit	g
					kg
					t
					lb
					cm³
					l
					m³
					gal
					kgal
					Cuft
					bbl
					Impgal
					KImpgal
				Total switch select	Flex total
					Mass total
					Volume total
					Net total
Detailed Setup	Display config	Disp select 1	Mass flow		
				Volume flow	
				Density	
				Temperature	
				Concentration meas	
				Net flow	
				F-Total flex	
				R-Total flex	
				D-Total flex	
				F-Total mass	
				R-Total mass	
				D-Total mass	
				F-Total volume	
				R-Total volume	
				D-Total volume	
				F-Total net	
				R-Total net	
				D-Total net	
				F-Total energy	
				Velocity	
				Drive gain	

7. PARAMETER DESCRIPTION

Detailed Setup		Disp select 2	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	
		Disp select 3	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			F-Total flex	
			R-Total flex	
			D-Total flex	
			F-Total mass	
			R-Total mass	
			D-Total mass	
			F-Total volume	
			R-Total volume	
			D-Total volume	
			F-Total net	
			R-Total net	
			D-Total net	
			F-Total energy	
			Velocity	
			Drive gain	
			None	

Detailed Setup

Disp select 4	Mass flow
	Volume flow
	Density
	Temperature
	Concentration meas
	Net flow
	F-Total flex
	R-Total flex
	D-Total flex
	F-Total mass
	R-Total mass
	D-Total mass
	F-Total volume
	R-Total volume
	D-Total volume
	F-Total net
	R-Total net
	D-Total net
	F-Total energy
	Velocity
	Drive gain
	None
Display contrast	-5
	-4
	-3
	-2
	-1
	0
	+1
	+2
	+3
	+4
	+5
Disp period	0.5s
	1.0s
	2.0s
Language	English
	German
	French
	Russian

Sel

Sel

Sel

Sel

7. PARAMETER DESCRIPTION

Detailed Setup	Sensor model		RCCS30	Sel	
			RCCS31		
			RCCS32		
			RCCS33		
			RCCS34		
			RCCS36		
			RCCS38		
			RCCS39		
			RCCS39/IR		
			RCCS39/XR		
	Sensor constants		Mass flow	SK20	R/W
				SKT	R/W
				SKTK	R/W
				RV	R/W
				Qnom	R
				SKP	R/W
				SKPT	R/W
			Density	KD	R/W
				fl20	R/W
				FTC1	R/W
				FTCK	R/W
				FPC	R/W
				FPTC	R/W
				FQC1	R/W
				FQC2	R/W
	Config fld variables		Flow direction	Forward	Sel
				Reverse	

Detailed Setup				
	Mass flow	Mass flow unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
		Mass flow format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	
		Mass flow LRV		R/W
		Mass flow URV		R/W
		Mass flow damping		R/W
		Mass flow lowcut		R/W
		Mass flow alm 1 sel	No function	Sel
			More than	
			Less than	
		Mass flow alm 1 crit		R/W
		Mass flow alm 2 sel	No function	Sel
			More than	
			Less than	
		Mass flow alm 2 crit		R/W
		Mass flow fix val sel	Inhibit	Sel
			Enable	
		Mass flow fixed val		R/W

7. PARAMETER DESCRIPTION

Detailed Setup	Volume flow	Vol flow unit	cm ³ /s	Sel
			cm ³ /min	
			cm ³ /h	
			l/s	
			l/min	
			l/h	
			l/d	
			m ³ /s	
			m ³ /min	
			m³/h	
			m ³ /d	
			gal/s	
			gal/min	
			gal/h	
			gal/d	
			Cuft/s	
			Cuft/min	
			Cuft/h	
			Cuft/d	
			bbl/s	
			bbl/min	
			bbl/h	
			bbl/d	
			Impgal/s	
			Impgal/min	
			Impgal/h	
			Impgal/d	
			l(N)/s	
			l(N)/min	
			l(N)/h	
			l(N)/d	
			m ³ (N)/s	
			m ³ (N)/min	
			m ³ (N)/h	
			m ³ (N)/d	
			Sl/s	
			Sl/min	
			Sl/h	
			Sl/d	
			Scuft/s	
			Scuft/min	
			Scuft/h	
			Scuft/d	
			Sm ³ /s	
			Sm ³ /min	
			Sm ³ /h	
			Sm ³ /d	

Detailed Setup			Vol flow format	xxxxxxx	Sel	
				xxxxx.X		
				xxxx.XX		
				xxx.XXX		
				xx.XXXX		
				x.XXXXX		
			Vol flow LRV		R/W	
			Vol flow URV		R/W	
			Vol flow damping		R/W	
			Vol flow lowcut		R/W	
			Vol flow alm 1 sel	No function	Sel	
				More than		
				Less than		
			Vol flow alm 1 crit		R/W	
			Vol flow alm 2 sel	No function	Sel	
				More than		
				Less than		
			Vol flow alm 2 crit		R/W	
			Density	Density unit	g/ml	Sel
					kg/l	
					kg/m³	
					lb/gal	
					lb/Cuft	
					g/cm³	
		g/l				
		°Bé hv				
		°Bé lt				
		°API				
		Density format			xxxxxxx	Sel
					xxxxx.X	
					xxxx.XX	
	xxx.XXX					
	xx.XXXX					
	x.XXXXX					
Density LRV		R/W				
Density URV		R/W				
Density damping		R/W				

7. PARAMETER DESCRIPTION

Detailed Setup			Density lowcut	R/W	
		Density alm 1 sel	No function	Sel	
			More than		
			Less than		
			Density alm 1 crit	R/W	
		Density alm 2 sel	No function	Sel	
			More than		
			Less than		
			Density alm 2 crit	R/W	
		Density fix val sel	Inhibit	Sel	
			Enable		
			Reference density	R/W	
			Density offset	R/W	
		Pressure Unit	bar	Sel	
			psi		
			MPa		
			Pressure	R/W	
	Temperature	Temperature unit	degC	Sel	
			degF		
			K		
		Temperature format	xxxxxxx	Sel	
			xxxxx.X		
			xxxx.XX		
			xxx.XXX		
			xx.XXXX		
			x.XXXXX		
				Temperature LRV	R/W
				Temperature URV	R/W
				Temperature damping	R/W
			Temp alm 1 sel	No function	Sel
				More than	
				Less than	
				Temp alm 1 crit	R/W

7. PARAMETER DESCRIPTION

Detailed Setup			Temp alm 2 sel	No function	Sel
				More than	
				Less than	
			Temp alm 2 crit		R/W
			Temp fix val select	Inhibit	Sel
				Enable	
			Temp fixed value		R/W
			Temp gain		R/W
		Velocity unit	m/s		Sel
			ft/s		
Config Output/Input	Analog output 1	Analog 1 select	Mass flow		Sel
			Volume flow		
			Density		
			Temperature		
			Concentration meas		
			Net flow		
			None		
		Analog 1 alarm Out	<2.4 mA		Sel
			<3.6 mA		
			<4.0 mA		
			>21.0 mA		
			>21.6 mA		
			Hold		
			Measured value		
		Analog 1 low LMT			R/W
		Analog 1 high LMT			R/W
	Analog output 2	Analog 2 select	Mass flow		Sel
			Volume flow		
			Density		
			Temperature		
			Concentration meas		
			Net flow		
			None		
		Analog 2 alarm Out	<2.4 mA		Sel
			<3.6 mA		
			<4.0 mA		
			>21.0 mA		
			>21.6 mA		
			Hold		
			Measured value		

7. PARAMETER DESCRIPTION

Detailed Setup			Analog 2 low LMT	R/W
			Analog 2 high LMT	R/W
	Pulse/Status out 1	Pulse/Stat 1 select	Pulse	Sel
			Status out	
			No function	
		Pulse 1 select	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	
		Pulse 1 unit	Hz	Sel
			g/P	
			kg/P	
t/P				
lb/P				
cm³/P				
l/P				
m³/P				
gal/P				
kgal/P				
Cuft/P				
bbl/P				
Impgal/P				
klmpgal/P				
l(N)/P				
m³(N)/P				
Sl/P				
Scuft/P				
Sm³/P				
		Pulse 1 rate	R/W	
Pulse 1 active mode		On Active	Sel	
		Off Active		

7. PARAMETER DESCRIPTION

Detailed Setup

Pulse 1 width	0.05ms	Sel
	0.1ms	
	0.5ms	
	1ms	
	5ms	
	10ms	
	50ms	
	100ms	
	50ms	
	1000ms	

Pulse 1 at alarm	0P/0Hz	Sel
	Measured value	
	Hold	

SO 1 function	No Function	Sel
	Flow direction	
	Total switch	
	Mass flow alm 1	
	Mass flow alm 2	
	Mass flow alm 1+2	
	Vol flow alm 1	
	Vol flow alm 2	
	Vol flow alm 1+2	
	Density alm 1	
	Density alm 2	
	Density alm 1+2	
	Temp alm 1	
	Temp alm 2	
	Temp alm 1+2	
	Concentr. meas alm 1	
	Concentr. meas alm 2	
	Concentr. meas alm 1+2	
	Net flow alm 1	
	Net flow alm 2	
	Net flow alm 1+2	
	Slug Alarm	
	Empty alarm	
	Corrosion Alarm	
	All alarms	
	All errors	
	All alarms & errors	

SO1 active mode	On Active	Sel
	Off Active	

Pulse/Status out 2	Pulse/Stat 2 select	Pulse	Sel
		Status out	
		No function	

7. PARAMETER DESCRIPTION

Detailed Setup		
	Pulse 2 select	Mass flow Sel
		Volume flow
		Density
		Temperature
		Concentration meas
		Net flow
		None
		F-Total mass
		R-Total mass
		F-Total volume
		R-Total volume
		F-Total net
		R-Total net
	Pulse 2 unit	Hz Sel
		g/P
		kg/P
		t/P
		lb/P
		cm³/P
		l/P
		m³/P
		gal/P
		kgal/P
		Cuft/P
		bbl/P
		Impgal/P
		kImpgal/P
		l(N)/P
		m³(N)/P
		Sl/P
		Scuft/P
		Sm³/P
	Pulse 2 rate	R/W
	Pulse 2 active mode	On Active Sel
		Off Active
	Pulse 2 width	0.05ms Sel
		0.1ms
		0.5ms
		1ms
		5ms
		10ms
		50ms
		100ms
		50ms
		1000ms

7. PARAMETER DESCRIPTION

Detailed Setup			Pulse 2 at alarm	0P/0Hz	Sel
				Measured value	
				Hold	
			SO2 function	No Function	Sel
				Flow direction	
				Total switch	
				Mass flow alm 1	
				Mass flow alm 2	
				Mass flow alm 1+2	
				Vol flow alm 1	
				Vol flow alm 2	
				Vol flow alm 1+2	
				Density alm 1	
				Density alm 2	
				Density alm 1+2	
				Temp alm 1	
				Temp alm 2	
				Temp alm 1+2	
				Concentr. meas alm 1	
				Concentr. meas alm 2	
				Concentr. meas alm 1+2	
				Net flow alm 1	
				Net flow alm 2	
				Net flow alm 1+2	
				Slug Alarm	
				Empty alarm	
				Corrosion Alarm	
				All alarms	
				All errors	
				All alarms & errors	
			SO2 active mode	On Active	Sel
				Off Active	
	Status input		SI function	No function	Sel
				Autozero	
				Reset flex totals	
				Reset mass totals	
				Reset volume totals	
				Reset net totals	
				Reset all totals	
				0% signal lock	
			SI active mode	On Active	Sel
				Off Active	

7. PARAMETER DESCRIPTION

Detailed Setup	HART output	PV is	Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
	SV is		Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	
			F-Total flex	
			R-Total flex	
			D-Total mass	
			D-Total volume	
			D-Total net	
			D-Total flex	
			F-Total energy	
			Velocity	
			Drive gain	
	TV is		Mass flow	Sel
			Volume flow	
			Density	
			Temperature	
			Concentration meas	
			Net flow	
			None	
			F-Total mass	
			R-Total mass	
			F-Total volume	
			R-Total volume	
			F-Total net	
			R-Total net	
			F-Total flex	
			R-Total flex	
			D-Total mass	
			D-Total volume	
			D-Total net	
			D-Total flex	
			F-Total energy	
			Velocity	
			Drive gain	

Detailed Setup

QV is	Mass flow	Sel
	Volume flow	
	Density	
	Temperature	
	Concentration meas	
	Net flow	
	None	
	F-Total mass	
	R-Total mass	
	F-Total volume	
	R-Total volume	
	F-Total net	
	R-Total net	
	F-Total flex	
	R-Total flex	
	D-Total mass	
	D-Total volume	
	D-Total net	
	D-Total flex	
	F-Total energy	
	Velocity	
	Drive gain	

Totalizer	Total flex select	Mass	Sel
		Volume	
		Net	
	Total flex unit	g	Sel
		kg	
		t	
		lb	
		cm ³	
		l	
		m ³	
		gal	
		kgal	
		Cuft	
		bbl	
		Impgal	
		KImpgal	
		l(N)	
		m ³ (N)	
		Sl	
		Scuft	
		MMscuft	
		Sm ³	
	Total mass unit	g	Sel
		kg	
		t	
		lb	

7. PARAMETER DESCRIPTION

Detailed Setup					
	Total volume unit	cm³	Sel		
		l			
		m³			
		gal			
		kgal			
		Cuft			
		bbl			
		Impgal			
		kimpgal			
		l(N)			
		m³(N)			
		Sl			
		Scuft			
		MMscuft			
		Sm³			
	Total net unit	g			
		kg			
		t			
		lb			
		cm³			
		l			
		m³			
		gal			
		kgal			
		Cuft			
		bbl			
		Impgal			
		kimpgal			
		Total unit energy		MJ	Sel
				Btu	
	Energy factor	Heat of combustion	R/W		
		Heat of combustion unit	MJ/kg	Sel	
			Btu/lb		
			MJ/m³(N)		
			Btu/Scuft		
	Total switch select	Flex total	Sel		
		Mass total			
		Volume total			
		Net total			
	Total limit switch		R/W		
	Total at alarm	Hold	Sel		
		Continue total			
	Total reset cntrl	Inhibit	Sel		
		Enable			

7. PARAMETER DESCRIPTION

Detailed Setup	Total reset	Not Execute	
		Reset flex totals	Exe
		Reset mass totals	Exe
		Reset volume totals	Exe
		Reset net totals	Exe
		Reset all totals	Exe
	HART communication	Poll addr	R/W
		Num req pream	R/W
		Num resp pream	R/W
		Master reset	Exe
	Concentration setup	Reference Temperature	R/W
		Ref. density carrier	R/W
		Temp. coeff. a carrier	R/W
		Temp. coeff. b carrier	R/W
		Ref. density product	R/W
		Temp. coeff. a product	R/W
		Temp. coeff. b product	R/W
	Concentration meas	Concentr. meas unit	°Brix
			Wt-% sol
			Vol% sol
			Vol%
			Wt-%
		Concentr. meas format	xxxxxx
			xxxx.X
			xxxx.XX
			xxx.XXX
			xx.XXXX
			x.XXXXX
		Concentr.meas LRV	R/W
		Concentr. meas URV	R/W
		Concentr. meas Damp	R/W
		Concentr. meas Lowcut	R/W

7. PARAMETER DESCRIPTION

Detailed Setup		Conc meas alm 1 Sel	No function	Sel
			More than	
			Less than	
		Conc meas alm 1 Crit		R/W
		Conc meas alm 2 Sel	No function	Sel
			More than	
			Less than	
		Conc meas alm 2 crit		R/W
	Net flow	Net flow select	Mass	Sel
			Volume	
		Net flow unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
			cm ³ /s	
			cm ³ /min	
			cm ³ /h	
			l/s	
			l/min	
			l/h	
			l/d	
			m ³ /s	
			m ³ /min	
			m ³ /h	
			m ³ /d	
			gal/s	
			gal/min	
			gal/h	
			gal/d	
			Cuft/s	
			Cuft/min	
			Cuft/h	
			Cuft/d	
			bbl/s	
			bbl/min	

Detailed Setup		bbl/h	
		bbl/d	
		lmpgal/s	
		lmpgal/min	
		lmpgal/h	
		lmpgal/d	
	Net flow format	xxxxxxx	Sel
		xxxxx.X	
		xxxx.XX	
		xxx.XXX	
		xx.XXXX	
		x.XXXXX	
	Net flow LRV		R/W
	Net flow URV		R/W
	Net flow damping		R/W
	Net flow lowcut		R/W
	Net flow Alm 1 Sel	No function	Sel
		More than	
		Less than	
	Net flow Alm 1 Crit		R/W
	Net flow Alm 2 Sel	No function	Sel
		More than	
		Less than	
	Net flow Alm 2 Crit		R/W
	Measuring range		R
	Slug detection	Slug alarm select	Sel
		Not apply	
		Apply	
		Drive gain	R
		Slug criteria	R/W
		Slug duration	R/W
		After slug	Sel
		Measured value	
		Hold	
		Drive gain damping	

7. PARAMETER DESCRIPTION

Detailed Setup	Empty pipe detect	Empty pipe alm sel	Not apply	Sel
			Apply	
		Empty pipe crit		R/W
		After empty pipe	Massflow=Zero	Sel
			Measured Value	
			Hold	
	Corrosion detect	Corrosion alm sel	Not apply	Sel
			Apply	
		Corrosion crit		R/W
		Corrosion damp		R/W
	Fluid max temp			R
	Device information	Distributor		R
		Tag		R/W
		Long Tag		R/W
		Descriptor		R/W
		Message		R/W
		Date		R/W
		Sensor model		R
		Sensor S/N		R
		Assembly number		R
		Serial no. converter		R
		Serial no. detector		R
		Device S/W	Device S/W version	R
			Device S/W date	R
		Device id		R
		Universal rev		R
		Fld dev rev		R
		Software rev		R
		Hardware rev		R

7.4 Parameter tree, HART menu

Online	Device setup	Set parameters for Rotamass (see below)
	PV	Display process value in engineering unit
	PV AO	Display analogue output in mA
	Review	Review parameters for Rotamass (see below)
	Service	Not open

Device
setup

Language	English
	German
	French
	Russian

Sel

Process variables	View fld dev vars	Mass flo		R
		Volume flo		R
		Dens		R
		Temp		R
		Conc meas		R
		Net flo		R
		F-Totl flex		R
		R-Totl flex		R
		D-Totl flex		R
		F-Totl mass		R
		R-Totl mass		R
		D-Totl mass		R
		F-Totl vol		R
		R-Totl vol		R
		D-Totl vol		R
		F-Totl net		R
		R-Totl net		R
		D-Totl net		R
		F-Totl energy		R
		Velocity		R
		Drive Gain		R
	View Outputs	Analog output 1	Analog 1 select	R
			PV	R
			PV AO	R
			% rng	R
		Analog output 2	Analog 2 select	R
			SV	R
			SV AO	R
			% rng	R
		Pulse/Status out 1	Pulse 1 select	R
			TV	R
			TV Freq	R
			SO 1 function	R
			SO 1 mode	R
			No function	R

7. PARAMETER DESCRIPTION

		Pulse/Status out 2	Pulse 2 select	R
			QV	R
			QV Freq	R
			SO 2 function	R
			SO 2 mode	R
			No function	R
	View Input	Input function		R
	Totalizer	Total res cntrl	Inhibit	Sel
			Enable	
		Total reset	Not execute	Exe
			Reset flex totals	Exe
			Reset mass totals	Exe
			Reset volume totals	Exe
			Reset net totals	Exe
			Reset all totals	Exe
Diag/ Service	Self test/Status	Self test	LCD/Key Test	Exe
			Self Test	Exe
		Status	Event overview	R
			Error	R
			Alarm	R
			Warning	R
		Hist Overview ord	Hist Overview ord	R
			Clear History ord	Sel
			Not execute	
			Execute	
		Hist Overview abs	History Set	R
			Abs	R
			Set 1	
			:	
			Set 10	R
		History Set menu	History Set	R
			Hist overview	R
			H. error	R
			H. Alarm	R
			H. Warning	R
		Clear History abs		Exe
	Input/Output test	Analog Out 1		R/W
		Analog Out 2		R/W
		Pulse Out 1		R/W
		Status Out 1		R/W
		Pulse Out 2		R/W
		Status Out 2		R/W
		Status Input		R

7. PARAMETER DESCRIPTION

Diag/ Service	Auto zero check	Autozero history	Data Set	1 Newest	R
				2	
				3	
				4	
				5 Oldest	
				Initial	
			Date		R
			Val		R
			Dens		R
			Temp		R
		AZ range			R
		AZ fluctuation			R
	Autozero	Zero tuning	Inhibit		Sel
			Enable		
		Autozero	Autozero duration	3min	Sel
				30s	
			Perform auto zero		Exe
			Autozero value		R
	Loop trim	Trim output 1			Exe
		Trim output 2			Exe
	Tag				R/W
	Long Tag				R/W

7. PARAMETER DESCRIPTION

Basic Setup	Display config	Disp select 1	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
		Disp select 2	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	

Basic Setup			Sel
	Disp select 3	Mass flo	
		Vol flo	
		Dens	
		Temp	
		Conc meas	
		Net flo	
		F-Totl flex	
		R-Totl flex	
		D-Totl flex	
		F-Totl mass	
		R-Totl mass	
		D-Totl mass	
		F-Totl vol	
		R-Totl vol	
		D-Totl vol	
		F-Totl net	
		R-Totl net	
		D-Totl net	
		F-Totl energy	
Velocity			
Drive Gain			
None			
Disp select 4	Mass flo	Sel	
	Vol flo		
	Dens		
	Temp		
	Conc meas		
	Net flo		
	F-Totl flex		
	R-Totl flex		
	D-Totl flex		
	F-Totl mass		
	R-Totl mass		
	D-Totl mass		
	F-Totl vol		
	R-Totl vol		
	D-Totl vol		
	F-Totl net		
	R-Totl net		
	D-Totl net		
	F-Totl energy		
	Velocity		
	Drive Gain		
None			
Display contrast	-5	Sel	
	-4		
	-3		
	-2		
	-1		
	0		
	+1		
	+2		
	+3		
	+4		
+5			

7. PARAMETER DESCRIPTION

Basic Setup

Mass flo	Mass flo unit	g/s	Sel	
		g/min		
		g/h		
		kg/s		
		kg/min		
		kg/h		
		kg/d		
		t/min		
		t/h		
		t/d		
		lb/s		
		lb/min		
		lb/h		
		lb/d		
		Mass flo LRV		R/W
Mass flo URV		R/W		
Mass flo Damping		R/W		
Dens	Dens unit	g/mL	Sel	
		kg/L		
		kg/m3		
		lb/gal		
		lb/Cuft		
		g/cm3		
		g/L		
		°Bé hv		
		°Bé lt		
		°API		
		Density LRV		R/W
		Density URV		R/W
		Density damping		R/W
		Temp	Temp unit	degC
		degF		
		K		
		Temp LRV		R/W
		Temp URV		R/W
Temp Damping		R/W		
Analog 1 select	Mass flo		Sel	
	Vol flo			
	Density			
	Temperature			
	Conc meas			
	Net flo			
	None			

7. PARAMETER DESCRIPTION

Basic Setup

Analog 2 select	Mass flo
	Vol flo
	Density
	Temperature
	Conc meas
	Net flo
	None

Sel

Pulse/Status out 1	Pulse/Stat 1 select	Pulse
		Status out
		No function

Sel

Pulse out 1	Pulse 1 select	Mass flo
		Vol flo
		Dens
		Temp
		Conc meas
		Net flo
		None
		F-Totl mass
		R-Totl mass
		F-Totl vol
		R-Totl vol
		F-Totl net
		R-Totl net

Sel

TV Pls unit	Hz
	g/P
	kg/p
	t/P
	lb/P
	cm3/P
	L/P
	m3/P
	gal/P
	kgal/P
	Cuft/P
	bbl/P
	Impgal/P
	kImpgal/P
	L(N)/P
	m3(N)/P
	L(Std)/P
	StdCuft/P
	m3(Std)/P

Sel

TV Pls rate

R/W

7. PARAMETER DESCRIPTION

Basic Setup						
	Status out 1		SO 1 function	No Function		
				Flow direction		
				Total Switch		
				Mass flo alm 1		
				Mass flo alm 2		
				Mass flo alm 1+2		
				Vol flo alm 1		
				Vol flo alm 2		
				Vol flo alm 1+2		
				Dens alm 1		
				Dens alm 2		
				Dens alm 1+2		
				Temp alm 1		
				Temp alm 2		
				Temp alm 1+2		
				Conc alm 1		
				Conc alm 2		
				Conc alm 1+2		
				Net flo alm 1		
				Net flo alm 2		
				Net flo alm 1+2		
				Slug Alarm		
				Empty Alarm		
				Corrosion Alarm		
				All Alarms		
				All Errors		
				All Alarms & Errors		
	Pulse/Status out 2		Pulse/Stat 2 select	Pulse		
			Status out			
			No function			
		Pulse out 2	Pulse 2 select	Mass flo		
				Vol flo		
				Dens		
				Temp		
				Conc meas		
				Net flo		
				None		
				F-Totl mass		
				R-Totl mass		
				F-Totl vol		
				R-Totl vol		
				F-Totl net		
				R-Totl net		

7. PARAMETER DESCRIPTION

Basic Setup		QV Pls unit	H _z	Sel
			g/P	
			kg/p	
			t/P	
			lb/P	
			cm ³ /P	
			L/P	
			m ³ /P	
			gal/P	
			kgal/P	
			Cuft/P	
			bbl/P	
			Impgal/P	
			kImpgal/P	
			L(N)/P	
			m ³ (N)/P	
			L(Std)/P	
			StdCuft/P	
			m ³ (Std)/P	
		QV Pls rate		R/W
	Status out 2	SO 2 function	No Function	Sel
			Flow direction	
			Total Switch	
			Mass flo alm 1	
			Mass flo alm 2	
			Mass flo alm 1+2	
			Vol flo alm 1	
			Vol flo alm 2	
			Vol flo alm 1+2	
			Dens alm 1	
			Dens alm 2	
			Dens alm 1+2	
			Temp alm 1	
			Temp alm 2	
			Temp alm 1+2	
			Conc alm 1	
			Conc alm 2	
			Conc alm 1+2	
			Net flo alm 1	
			Net flo alm 2	
			Net flo alm 1+2	
			Slug Alarm	
			Empty Alarm	
			Corrosion Alarm	
			All Alarms	
			All Errors	
			All Alarms & Errors	

7. PARAMETER DESCRIPTION

Basic Setup	Input function	No function	Sel				
		Autozero					
		Reset flex totals					
		Reset mass totals					
		Reset volume totals					
		Reset net totals					
		Reset all totals					
		0% Signal lock					
	Totalizer	Total flex select	Mass	Sel			
			Volume				
			Net				
		F-Totl flex Unit	g				
			kg				
			t				
			lb				
			cm3				
			L				
			m3				
			gal				
			kgal				
			Cuft				
			bbl				
			Impgal				
			klmpgal				
			L(N)				
			m3(N)				
			L(Std)				
			StdCuft				
			MMscuft				
			m3(Std)				
					F-Totl mass Unit	g	Sel
						kg	
						t	
						lb	
					F-Totl vol Unit	cm3	Sel
						L	
						m3	
						gal	
						kgal	
	Cuft						
bbl							
Impgal							
klmpgal							
L(N)							
m3(N)							
L(Std)							
StdCuft							
MMscuft							
m3(Std)							

7. PARAMETER DESCRIPTION

Basic Setup	F-Totl net Unit	g	Sel
		kg	
		t	
		lb	
		cm3	
		L	
		m3	
		gal	
		kgal	
		Cuft	
		bbl	
		Impgal	
		kImpgal	
		L(N)	
		m3(N)	
		L(Std)	
		StdCuft	
		MMscuft	
		m3(Std)	
	Total switch select	Flex total	Sel
		Mass total	
		Volume total	
		Net total	

Detailed Setup	Display config	Disp Select 1	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	

7. PARAMETER DESCRIPTION

Detailed Setup		Disp Select 2	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	
		Disp Select 3	Mass flo	Sel
			Vol flo	
			Dens	
			Temp	
			Conc meas	
			Net flo	
			F-Totl flex	
			R-Totl flex	
			D-Totl flex	
			F-Totl mass	
			R-Totl mass	
			D-Totl mass	
			F-Totl vol	
			R-Totl vol	
			D-Totl vol	
			F-Totl net	
			R-Totl net	
			D-Totl net	
			F-Totl energy	
			Velocity	
			Drive Gain	
			None	

Detailed
Setup

Disp Select 4	Mass flo
	Vol flo
	Dens
	Temp
	Conc meas
	Net flo
	F-Totl flex
	R-Totl flex
	D-Totl flex
	F-Totl mass
	R-Totl mass
	D-Totl mass
	F-Totl vol
	R-Totl vol
	D-Totl vol
	F-Totl net
	R-Totl net
	D-Totl net
	F-Totl energy
	Velocity
	Drive Gain
	None

Sel

Display contrast	-5
	-4
	-3
	-2
	-1
	0
	+1
	+2
	+3
	+4
	+5

R/W

Display period	0.5s
	1.0s
	2.0s

Sel

Language	English
	German
	French
	Russian

Sel

Sensor model	RCCS30
	RCCS31
	RCCS32
	RCCS33
	RCCS34
	RCCS36
	RCCS38
	RCCS39
	RCCS39/IR
	RCCS39/XR

Sel

7. PARAMETER DESCRIPTION

Detailed Setup	Sensor constants	Mass flo	SK20	R/W
			SKT	R/W
			SKTK	R/W
			RV	R/W
			Qnom	R
			SKP	R/W
			SKPT	R/W
		Density	KD	R/W
			FI20	R/W
			FTC1	R/W
			FTCK	R/W
			FPC	R/W
			FPTC	R/W
			FQC1	R/W
			FQC2	R/W
	Config fld var	Flow direction	Forward	Sel
			Reverse	
		Mass flo	Mass flo unit	Sel
			g/s	
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			td	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
		Mass flo format	xxxxxxx	Sel
			xxxxx.X	
			xxxx.XX	
			xxx.XXX	
			xx.XXXX	
			x.XXXXX	
		Mass flo LRV		R/W
		Mass flo URV		R/W

7. PARAMETER DESCRIPTION

Detailed Setup			Mass flo damping	R/W
			Mass flo lowcut	R/W
			Mass flo alm 1 sel	Sel
			More than	
			Less than	
			Mass flo alm 1 crit	R/W
			Mass flow alm 2 sel	Sel
			More than	
			Less than	
			Mass flo alm 2 crit	R/W
			Mass flo fix sel	Sel
			Inhibit	
			Enable	
			Mass flo fix menu	R/W
			Mass flo fixed val	
	Vol flo	Vol flo Unit	cm3/s	Sel
			cm3/min	
			cm3/h	
			L/s	
			L/min	
			L/h	
			L/d	
			m3/s	
			m3/min	
			m3/h	
			m3/d	
			gal/s	
			gal/min	
			gal/h	
			gal/d	
			Cuft/s	
			Cuft/min	
			Cuft/h	
			Cuft/d	
			bbl/s	
			bbl/min	
			bbl/h	
			bbl/d	
			Impgal/s	
			Impgal/min	
			Impgal/h	
			Impgal/d	
			L(N)/s	
			L(N)/min	
			L(N)/h	
			L(N)/d	
			m3(N)/s	
			m3(N)/min	
			m3(N)/h	
			m3(N)/d	

7. PARAMETER DESCRIPTION

Detailed Setup				L(Std)/s	
				L(Std)/min	
				L(Std)/h	
				L(Std)/d	
				StdCuft/s	
				StdCuft/min	
				StdCuft/h	
				StdCuft/d	
				m3(Std)/s	
				m3(Std)/min	
				m3(Std)/h	
				m3(Std)/d	
			Vol flo Format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	
			Vol flo LRV		R/W
			Vol flo URV		R/W
			Vol flo damping		R/W
			Vol flo Lowcut		R/W
			Vol flo alm 1 sel	No function	Sel
				More than	
				Less than	
			Vol flo alm 1 crit		R/W
			Vol flow alm 2 sel	No function	Sel
				More than	
				Less than	
			Vol flo alm 2 crit		R/W
	Dens	Dens Unit		g/mL	Sel
				kg/L	
				kg/m3	
				lb/gal	
				lb/Cuft	
				g/cm3	
				g/L	
				°Bé hv	
				°Bé lt	
				°API	
			Dens Format	xxxxxxx	Sel
				xxxxx.X	
				xxxx.XX	
				xxx.XXX	
				xx.XXXX	
				x.XXXXX	

Detailed Setup			Dens LRV	R/W		
			Dens URV	R/W		
			Dens damping	R/W		
			Dens lowcut	R/W		
			Dens alm 1 sel	No function	Sel	
				More than		
				Less than		
			Dens alm 1 crit		R/W	
			Dens alm 2 sel	No function	Sel	
				More than		
				Less than		
			Dens alm 2 crit		R/W	
			Dens fix val sel	Inhibit	Sel	
				Enable		
			Dens fix menu	Reference density	R/W	
			Pressure Unit	bar		
				psi		
				MPa		
			Pressure			
			Temp	Temp Unit	degC	Sel
					degF	
					K	
				Temp Format	xxxxxxx	Sel
					xxxxx.X	
					xxxx.XX	
					xxx.XXX	
					xx.XXXX	
					x.XXXXX	
				Temp LRV		R/W
				Temp URV		R/W
				Temp damping		R/W
				Temp alm 1 sel	No function	Sel
					More than	
					Less than	
				Temp alm 1 crit		R/W
	Temp alm 2 sel	No function	Sel			
		More than				
		Less than				

7. PARAMETER DESCRIPTION

Detailed Setup			Temp alm 2 crit	R/W	
		Temp fix val sel	Inhibit	Sel	
			Enable		
		Temp fix menu	Temp fixed value	R/W	
			Temp gain adjust		
		Velocity unit	m/s	Sel	
			ft/s		
	Config Output/Input	Analog output 1	Analog 1 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
			Analog 1 alarm Out	<2.4mA	Sel
				<3.6mA	
				<4.0mA	
				>21.0mA	
				>21.6mA	
				Hold	
				Measured value	
			Analog 1 low LMT		R/W
			Analog 1 high LMT		R/W
		Analog output 2	Analog 2 select	Mass flo	Sel
				Vol flo	
				Dens	
				Temp	
				Conc meas	
				Net flo	
				None	
			SV Analog 2 alarm Out	<2.4mA	Sel
				<3.6mA	
				<4.0mA	
				>21.0mA	
				>21.6mA	
				Hold	
				Measured value	
		Analog 2 low LMT		R/W	
		Analog 2 high LMT		R/W	
	Pulse/Status 1	Pulse/Stat 1 sel	Pulse	Sel	
			Status out		
			No function		

7. PARAMETER DESCRIPTION

Detailed
Setup

Pulse/freq out 1	Pulse 1 select	Mass flo	Sel
		Vol flo	
		Dens	
		Temp	
		Conc meas	
		Net flo	
		None	
		F-Totl mass	
		R-Totl mass	
		F-Totl vol	
		R-Totl vol	
		F-Totl net	
		R-Totl net	
	Freq/Pulse out 1	TV Pls unit	Sel
		Hz	
		g/P	
		kg/P	
		t/P	
		lb/P	
		cm3/P	
		L/P	
		m3/P	
		gal/P	
		kgal/P	
		Cuft/P	
		bbl/P	
		Impgal/P	
		kImpgal/P	
		L(N)/P	
		m3(N)/P	
		L(Std)/P	
		StdCuft/P	
		m3(Std)/P	
		TV Pls rate	R/W
		TV Pls mode	Sel
		On Active	
		Off Active	
		TV Pls width	Sel
		0.05ms	
		0.1ms	
		0.5ms	
		1ms	
		5ms	
		10ms	
		50ms	
		100ms	
		500ms	
		1000ms	
		TV Pls alarm	Sel
		0 Hz / 0 Pulses	
		Hold	
		Measured value	

7. PARAMETER DESCRIPTION

Detailed Setup			Status out 1		SO 1 function	No function	Sel		
						Flow direction			
						Total switch			
						Mass flo alm 1			
						Mass flo alm 2			
						Mass flo alm 1+2			
						Vol flo alm 1			
						Vol flo alm 2			
						Vol flo alm 1+2			
						Dens alm 1			
						Dens alm 2			
						Dens alm 1+2			
						Temp alm 1			
						Temp alm 2			
						Temp alm 1+2			
						Conc alm 1			
						Conc alm 2			
						Conc alm 1+2			
						Net flo alm 1			
						Net flo alm 2			
						Net flo alm 1+2			
						Slug Alarm			
						Empty Alarm			
						Corrosion Alarm			
						All alarms			
						All errors			
						All alarms & errors			
						SO 1 active mode		On Active	Sel
								Off Active	
					Pulse/Status 2	Pulse/Stat 2 sel		Pulse	Sel
								Status out	
								No function	
								Pulse/freq out 2	Pulse 2 select
								Vol flo	
								Dens	
								Temp	
								Conc meas	
								Net flo	
								None	
								F-Totl mass	
								R-Totl mass	
								F-Totl vol	
								R-Totl vol	
								F-Totl net	
								R-Totl net	

7. PARAMETER DESCRIPTION

Detailed
Setup

Freq/Pulse out 2	QV Pls unit	Sel
	Hz	
	g/P	
	kg/P	
	t/P	
	lb/P	
	cm3/P	
	L/P	
	m3/P	
	gal/P	
	kgal/P	
	Cuft/P	
	bbbl/P	
	Impgal/P	
	kImpgal/P	
	L(N)/P	
	m3(N)/P	
	L(Std)/P	
	StdCuft/P	
	m3(Std)/P	
	QV Pls rate	R/W
	QV Pls mode	Sel
	On Active	
	Off Active	
	QV Pls width	Sel
	0.05ms	
	0.1ms	
	0.5ms	
	1ms	
	5ms	
	10ms	
	50ms	
	100ms	
	500ms	
	1000ms	
	QV Pls alarm	Sel
	0 Hz / 0 Pulses	
	Hold	
	Measured value	

7. PARAMETER DESCRIPTION

Detailed Setup			
	Status out 2	SO 2 function	Sel
		No function	
		Flow direction	
		Total switch	
		Mass flo alm 1	
		Mass flo alm 2	
		Mass flo alm 1+2	
		Vol flo alm 1	
		Vol flo alm 2	
		Vol flo alm 1+2	
		Dens alm 1	
		Dens alm 2	
		Dens alm 1+2	
		Temp alm 1	
		Temp alm 2	
		Temp alm 1+2	
		Conc alm 1	
		Conc alm 2	
		Conc alm 1+2	
		Net flo alm 1	
		Net flo alm 2	
		Net flo alm 1+2	
		Slug alarm	
		Empty alarm	
		Corrosion alarm	
		All alarms	
		All errors	
		All alarms & errors	
		SO 2 active mode	Sel
		On Active	
		Off Active	
	Status input	Input function	Sel
		No Function	
		Autozero	
		Reset flex totals	
		Reset mass totals	
		Reset volume totals	
		Reset net totals	
		Reset all totals	
		0% signal lock	
		SI active mode	Sel
		On Active	
		Off Active	

Detailed
Setup

HART Output	PV is	Mass flo
		Vol flo
		Dens
		Temp
		Conc meas
		Net flo
		None
	SV is	Mass flo
		Vol flo
		Dens
		Temp
		Conc meas
		Net flo
		None
		F-Totl mass
		R-Totl mass
		F-Totl vol
		R-Totl vol
		F-Totl net
		R-Totl net
		F-Totl flex
		R-Totl flex
		D-Totl mass
		D-Totl vol
		D-Totl net
		D-Totl flex
		F-Totl energy
		Velocity
		Drive Gain
	TV is	Mass flo
		Vol flo
		Dens
		Temp
		Conc meas
		Net flo
		None
		F-Totl mass
		R-Totl mass
		F-Totl vol
		R-Totl vol
		F-Totl net
		R-Totl net
		F-Totl flex
		R-Totl flex
		D-Totl mass
		D-Totl vol
		D-Totl net
		D-Totl flex
		F-Totl energy
		Velocity
		Drive Gain

7. PARAMETER DESCRIPTION

Detailed Setup			QV is	Mass flo
				Vol flo
				Dens
				Temp
				Conc meas
				Net flo
				None
				F-Totl mass
				R-Totl mass
				F-Totl vol
				R-Totl vol
				F-Totl net
				R-Totl net
				F-Totl flex
				R-Totl flex
				D-Totl mass
				D-Totl vol
				D-Totl net
				D-Totl flex
				F-Totl energy
				Velocity
				Drive Gain
	Totalizer	Total flex select	Mass	
			Volume	
			Net	
		F-Totl flex Unit	g	
			kg	
			t	
			lb	
			cm3	
			L	
			m3	
			gal	
			kgal	
			Cuft	
			bbl	
			Impgal	
			klmpgal	
			L(N)	
			m3(N)	
			L(Std)	
			StdCuft	
			MMscuft	
			m3(Std)	
		F-Totl mass Unit	g	
			kg	
			t	
			lb	

Sel

Detailed
Setup

F-Totl vol Unit	cm3	Sel	
	L		
	m3		
	gal		
	kgal		
	Cuft		
	bbl		
	Impgal		
	klmpgal		
	L(N)		
	m3(N)		
	L(Std)		
	StdCuft		
	MMscuft		
	m3(Std)		
	F-Totl net Unit	g	Sel
	kg		
	t		
	lb		
	cm3		
	L		
	m3		
	gal		
	kgal		
	Cuft		
	bbl		
	Impgal		
	klmpgal		
	L(Std)		
	StdCuft		
	MMscuft		
	m3(Std)		
	F-Totl energy Unit	MJ	Sel
		Btu	
Energy factor	Heat of combust unit	MJ/kg	Sel
		Btu/lb	
		MJ/Nm3	
		Btu/Scuft	
		Heat of combustion	R/W
	Total switch select	Flex	Sel
	Mass		
	Volume		
	Net		
	Total limit switch		R/W
Total at alarm	Hold	Sel	
	continue		
Total res cntrl	Inhibit	Sel	
	Enable		

7. PARAMETER DESCRIPTION

Detailed Setup	Total reset	Not execute	Exe
		Reset flex total	Exe
		Reset mass total	Exe
		Reset volume total	Exe
		Reset net total	Exe
		Reset all totals	Exe
	HART communication	Poll addr	R/W
		Num req pream	R/W
		Num resp preams	R/W
		Master reset	Exe
	Conc meas setup	Ref. temperature	R/W
		Ref. dens. carrier	R/W
		Coeff. a carrier	R/W
		Coeff b carrier	R/W
		Ref. dens. product	R/W
		Coeff. a product	R/W
		Coeff. b product	R/W
	Conc meas	Conc meas unit	Sel
		degBrix	
		% sol-wt	
		% sol-vol	
		Wt-%	
		Vol-%	
	Conc meas Format	xxxxxxx	Sel
		xxxxx.X	
		xxxx.XX	
		xxx.XXX	
		xx.XXXX	
		x.XXXXX	
	Conc meas LRV		R/W
	Conc meas URV		R/W
	Conc meas Damp		R/W
	Conc meas Lowcut		R/W
	Conc meas alm 1 sel	No function	Sel
		More than	
		Less than	
	Conc meas alm 1 crit		R/W

7. PARAMETER DESCRIPTION

Detailed Setup		Conc meas alm 2 sel	No function	Sel
			More than	
			Less than	
		Conc meas alm 2 crit		R/W
	Net flo	Net flow select	Mass	Sel
			Volume	
			Not applicable	
		Net flo Unit	g/s	Sel
			g/min	
			g/h	
			kg/s	
			kg/min	
			kg/h	
			kg/d	
			t/min	
			t/h	
			t/d	
			lb/s	
			lb/min	
			lb/h	
			lb/d	
			cm3/s	
			cm3/min	
			cm3/h	
			L/s	
		L/min		
		L/h		
		L/d		
		m3/s		
		m3/min		
		m3/h		
		m3/d		
		gal/s		
		gal/min		
		gal/h		
		gal/d		
		Cuft/s		
		Cuft/min		
		Cuft/h		
		Cuft/d		
		bbl/s		
		bbl/min		
		bbl/h		
		bbl/d		
		Impgal/s		
		Impgal/min		
		Impgal/h		
		Impgal/d		
	Net flo Format	xxxxxxx	Sel	
		xxxxx.X		
		xxxx.XX		
		xxx.XXX		
		xx.XXXX		
		x.XXXXX		

7. PARAMETER DESCRIPTION

Detailed Setup	Net flo LRV		R/W
	Net flo URV		R/W
	Net flo Damp		R/W
	Net flo lowcut		R/W
	Net flo alm 1 sel	No function	Sel
		More than	
		Less than	
	Net flo alm 1 crit		R/W
	Net flo alm 2 sel	No function	Sel
		More than	
		Less than	
	Net flo alm 2 crit		R/W
	Measuring Range		R
	Slug detection	Slug alarm select	Sel
		Not apply	
	Slug detection	Apply	R
		Drive gain	
		Slug criteria	
		Slug duration	
		After slug	
		Measured value	
		Hold	
		Drive gain damping	
	Empty pipe detect	Empty pipe alm sel	Sel
		Not apply	
	Empty pipe detect	Apply	R/W
		Empty pipe crit	
		After empty pipe	
		Massflow =Zero	
		Measured Value	
	Corrosion detect	Corrosion alm sel	Sel
		Not apply	
		Apply	
		Corrosion crit	
	Corrosion detect	Corrosion damp	R/W
			R/W
	Fluid max temp		R

7. PARAMETER DESCRIPTION

Detailed Setup	Device information		Tag	R/W
		Long Tag		R/W
		Descriptor		R/W
		Message		R/W
		Date		R/W
		Sensor model		R
		Sensor S/N		R
		Final asmbly num		R
	S/N Converter		R	
	S/N Detector		R	
	Revision #'s	Universal rev	R	
		Fld dev rev	R	
		Software rev	R	
		Hardware rev	R	
	Device S/W	Device S/W version	R	
		Device S/W date	R	
Review Device info	Distributor			R
	Sensor model			R
	Sensor S/N			R
	Final asmbly num			R
	Tag			R
	Long Tag			R
	Descriptor			R
	Message			R
	Date			R
	Dev id			R
	Universal rev			R
	Fld dev rev			R
	Software rev			R
	Hardware rev			R
	Device S/W version			R
	Device S/W date			R
	S/N Converter			R
S/N Detector			R	

7. PARAMETER DESCRIPTION

Review Sensor	SK20	R
	SKT	R
	SKTK	R
	RV	R
	Qnom	R
	SKP	R
	SKPT	R
	KD	R
	fl20	R
	FTC1	R
	FTCK	R
	FPC	R
	FPTC	R
	FQC1	R
	FQC2	R
	Autozero value	R
Rev Fld Dev vars 1	Flow direction	R
	Mass flo unit	R
	Mass flo LRV	R
	Mass flo URV	R
	Mass flo damp	R
	Mass flo lowcut	R
	Mass flo alm 1 sel	R
	Mass flo alm 1 crit	R
	Mass flo alm 2 sel	R
	Mass flo alm 2 crit	R
	Mass flo fixed value	R
	Vol flo unit	R
	Vol flo LRV	R
	Vol flo URV	R
	Vol flo damp	R
	Vol flo lowcut	R
	Vol flo alm 1 sel	R
	Vol flo alm 1 crit	R
	Vol flo alm 2 sel	R
	Vol flo alm 2 crit	R
	Dens unit	R
	Dens LRV	R
	Dens URV	R
	Dens damp	R
	Dens lowcut	R
	Dens alm 1 sel	R
	Dens alm 1 crit	R
	Dens alm 2 sel	R
	Dens alm 2 crit	R
	Reference density	R
	Density offset	R
	Pressure	R
	Pressure unit	R

7. PARAMETER DESCRIPTION

Rev Fld Dev vars 1	Temperature unit	R
	Temp LRV	R
	Temp URV	R
	Temp damp	R
	Temp range select	R
	Temp alm 1 select	R
	Temp alm 1 crit	R
	Temp alm 2 select	R
	Temp alm 2 crit	R
	Temp fixed value	R
	Velocity unit	R
Rev Fld Dev vars 2	Conc meas Unit	R
	Conc meas LRV	R
	Conc meas URV	R
	Conc meas damp	R
	Conc meas lowcut	R
	Conc alm 1 select	R
	Conc alm 1 crit	R
	Conc alm 2 sel	R
	Conc alm 2 crit	R
	Net flo select	R
	Net flo unit	R
	Net flo LRV	R
	Net flo URV	R
	Net flo damping	R
	Net flo lowcut	R
	Net flo alm 1 sel	R
	Net flo alm 1 crit	R
	Net flo alm 2 sel	R
	Net flo alm 2 crit	R
Rev Outputs /Input	Analog 1 select	R
	PV Alarm 1 select	R
	PV Analog 1 low LMT	R
	PV Analog 1 high LMT	R
	Analog 2 select	R
	SV Alarm 2 select	R
	SV Analog 2 low LMT	R
	SV Analog 2 high LMT	R
	Pulse/Stat 1 sel	R
	Pulse 1 select	R
	Pls Unit	R
	Pls Rate	R
	Pls Mode	R
	Pls Width	R
	Pls Alarm	R
	SO 1 function	R
	SO 1 active mode	R
	Pulse/Stat 2 select	R
	Pulse 2 select	R
	Pls Unit	R
	Pls Rate	R

7. PARAMETER DESCRIPTION

	Pls Mode	R
	Pls Width	R
	Pls Alarm	R
	SO 2 function	R
	SO 2 active mode	R
	Input function	R
	SI active mode	R
	PV is	R
	SV is	R
	TV is	R
	QV is	R
	Total flex select	R
	F-Totl flex Unit	R
	F-Totl mass Unit	R
	F-Totl vol Unit	R
	F-Totl net Unit	R
	F-Totl energy Unit	R
	Heat of combust unit	R
	Heat of combustion	R
	Total switch sel	R
	Total limit switch	R
	Total at alarm	R
	Total res cntrl	R
Rev HART	Poll addr	R
	Num req pream	R
	Num resp pream	R

7.5 Mass flow functions (Basic or Detailed Setup)

Mass flow	To set the functions of mass flow measurement.
Mass flow unit	Select: g/s, g/min, g/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, lb/s, lb/min, lb/h, lb/d
Mass flow format	Select: xxxxxxx,xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
Mass flow LRV (low range value)	Set a mass flow value to the 4 mA or 0 Hz. LRV can also be negative to measure reverse flow.
Mass flow URV (upper range value)	Set a mass flow value to the 20 mA or xxxxxHz. $Abs(URV-LRV) \geq 5\%$ of Qnom for liquids (1% for gases)
Mass flow damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed ($t=63\%$).
Mass flow lowcut	Set the low cut. Low cut affects outputs and display and applies to negative and positive flow. A hysteresis of 0.05% of Qnom is given by the system.
Mass flow alm 1 sel	Select: No function, More than, Less than
Mass flow alm 1 crit	Select a mass flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Mass flow alm 2 sel	Select: No function, More than, Less than
Mass flow alm 2 sel Restrictions: All alarms have to be in 0-110% of URV-LRV. Alarm criteria 2 must always be larger than alarm criteria 1.	Select a mass flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Mass flow fix val sel	Select: Inhibit, Enable
Mass flow fixed value	Select a fix Mass flow value (only for test purpose or in case of maintenance). The set value is added to the actual value. In case of no flow it will vary with the zero fluctuation.

7.6 Volume flow functions (Basic or Detailed Setup)

Volume flow	To set the functions of volume flow measurement. Notice: Volume flow is derived density and mass flow measurement. Errors in density measurement (e.g. from gas bubbles) effects the accuracy of volume flow. For liquid it is recommended to use mass flow as original measurement. Density below $\rho_{0H} = 0.3 \text{ kg/l}$ volume flow is set to zero (for liquids)
Vol flow unit	Select: cm³/s, cm³/min, cm³/h, l/s, l/min, l/h, l/d, m³/s, m³/min, m³/h, m³/d, gal/s, gal/min, gal/h, gal/d, Cuft/s, Cuft/min, Cuft/h, Cuft/d, bbl/s, bbl/min, bbl/h, bbl/d, Impgal/s, Impgal/min, Impgal/h, Impgal/d, l(N)/s, l(N)/min, l(N)/h, l(N)/d, m³(N)/s, m³(N)/min, m³(N)/h, m³(N)/d, Sl/s, Sl/min, Sl/h, Sl/d, Scuft/s, Scuft/min, Scuft/h, Scuft/d, Sm³/s, Sm³/min, Sm³/h, Sm³/d l(N)/s, l(N)/min, l(N)/h, l(N)/d, m³(N)/s, m³(N)/min, m³(N)/h, m³(N)/d only for gas application. Sl/s, Sl/min, Sl/h, Sl/d, Scuft/s, Scuft/min, Scuft/h, Scuft/d, Sm³/s, Sm³/min, Sm³/h, Sm³/d only for gas application or if Reference density value is selected.
Vol flow format	Select; xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
Vol flow LRV (low range value)	Set a volume flow value to the 4 mA or 0 Hz. LRV can also be negative to measure reverse flow.
Vol flow URV (upper range value)	Set a volume flow value to the 20 mA or xxxxx Hz. $\text{Abs}(\text{URV-LRV}) \geq 5\%$ of Q_{nom} for liquids. For gas application $\text{Abs}(\text{URV-LRV}) \geq 1\%$
Vol flow damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed ($t=63\%$)
Vol flow lowcut	Set the low cut. Low cut affects outputs and display. Any low cut on mass flow will affect volume flow also. A hysteresis of 0.05% of Q_{nom} on mass flow is given by the system.
Vol flow alm 1 sel	Select: No function, More than, Less than
Vol flow alm 1 crit	Select a volume flow alarm level. What happens in case of an alarm has to be defined in Status (7.12, 7.13).
Vol flow alm 2 sel	Select: No function, More than, Less than
Vol flow alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV. Alarm criteria 2 must always be larger than alarm criteria 1.	Select a volume flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).

7.7 Density functions (Basic or Detailed Setup)

Density	To set the functions of density measurement. Notice: Density measurement is only reliable if there is no gas in the liquid. For liquid measurement a density lower 0.3 kg/l is displayed as 0.0 kg/l. For gas measurement set a fixed density value.														
Density unit	Select: g/ml, kg/l, kg/m³, lb/gal, lb/Cuft, g/cm³, g/l, °Bé hv, °Bé lt, °API °Bé hv, °Bé lt, °API only with option /CST														
Density format	Select: xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX														
Density LRV (low range value)	Set a density value to the 4 mA or 0 Hz.														
Density URV (upper range value)	Set a density value to the 20 mA or xxxxx Hz. Abs(URV-LRV) ≥ 0.05 kg/l														
Density damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%)														
Density lowcut	Set the low cut. Low cut affects outputs and display.														
Density alm 1 sel	Select: No function, More than, Less than														
Density alm 1 crit	Select a density alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).														
Density alm 2 sel	Select: No function, More than, Less than														
Density alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a density alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).														
Density fix val sel	Select: Inhibit, Enable														
Reference density	Select a density value. For gas measurement (option /GA) set here your actual density for output of volume flow. For output of standard or normal volume flow set the standard or normal density of your gas accordingly. For liquid measurement this parameter can also be used to enter the standard density of your liquid for output of standard volume flow or for the actual density in case of density disturbances.														
Density offset	If the Rotamass detector is installed horizontally (bend down) the value from the following table must be entered according to the concerning sensor model. <table border="1"> <tbody> <tr> <td>RCCS30</td><td>13.50 g/l</td></tr> <tr> <td>RCCS31</td><td>1.80 g/l</td></tr> <tr> <td>RCCS32</td><td>2.00 g/l</td></tr> <tr> <td>RCCS33</td><td>0.60 g/l</td></tr> <tr> <td>RCCx34</td><td>0.90 g/l</td></tr> <tr> <td>RCCx36</td><td>0.35 g/l</td></tr> <tr> <td>RCCx38 to 39/XR</td><td>0 g/l (default)</td></tr> </tbody> </table>	RCCS30	13.50 g/l	RCCS31	1.80 g/l	RCCS32	2.00 g/l	RCCS33	0.60 g/l	RCCx34	0.90 g/l	RCCx36	0.35 g/l	RCCx38 to 39/XR	0 g/l (default)
RCCS30	13.50 g/l														
RCCS31	1.80 g/l														
RCCS32	2.00 g/l														
RCCS33	0.60 g/l														
RCCx34	0.90 g/l														
RCCx36	0.35 g/l														
RCCx38 to 39/XR	0 g/l (default)														
Pressure	Set the average static line pressure: Static pressure effect on density and mass flow will be corrected automatically.														
Pressure unit	Select: bar, psi, MPa														
ROTAMASS is density-calibrated vertically. If the ROTAMASS detector is installed horizontal an density offset value from the above table has to be entered to the parameter reference density. As positive values if the tubes are down and as negative value if the tubes are up.															

7.8 Temperature functions (Basic or Detailed Setup)

Temperature	To set the functions of temperature measurement. Notice: Standard range: -200 to 230°C High temp. range (/HT): 0 to 400°C
Temperature Unit	Select: degC, degF, K
Temperature format	Select: xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
Temperature LRV (low range value)	Set a temperature value to the 4 mA or 0 Hz
Temperature URV (upper range value)	Set a temperature value to the 20 mA or xxxxx Hz. $Abs(URV-LRV) \geq 10K$
Temperature damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed ($t=63\%$).
Temperature alm 1 sel	Select: No function, More than, Less than
Temperature alm 1 crit	Select a temperature alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Temperature alm 2 sel	Select: No function, More than, Less than
Temperature alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a temperature alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Temperature fix val select	Select: Inhibit, Enable
Temperature fixed value	Select a temperature value in case of malfunction of the built in temperature sensor.
Temperature gain	The ROTAMASS temperature sensor is installed outside of the measuring tubes. So at high or low fluid temperature the temperature measurement may show a deviation as a function of the quality of heat insulation. This function allows correcting temperature measurement for better accuracy in mass flow and density. Note: It is not recommended to use this function unless correct measurement over the complete process temperature range can be confirmed. It is not sufficient to proof correct measurement at one temperature or in a very narrow temperature range unless the process operates exclusively within this range.

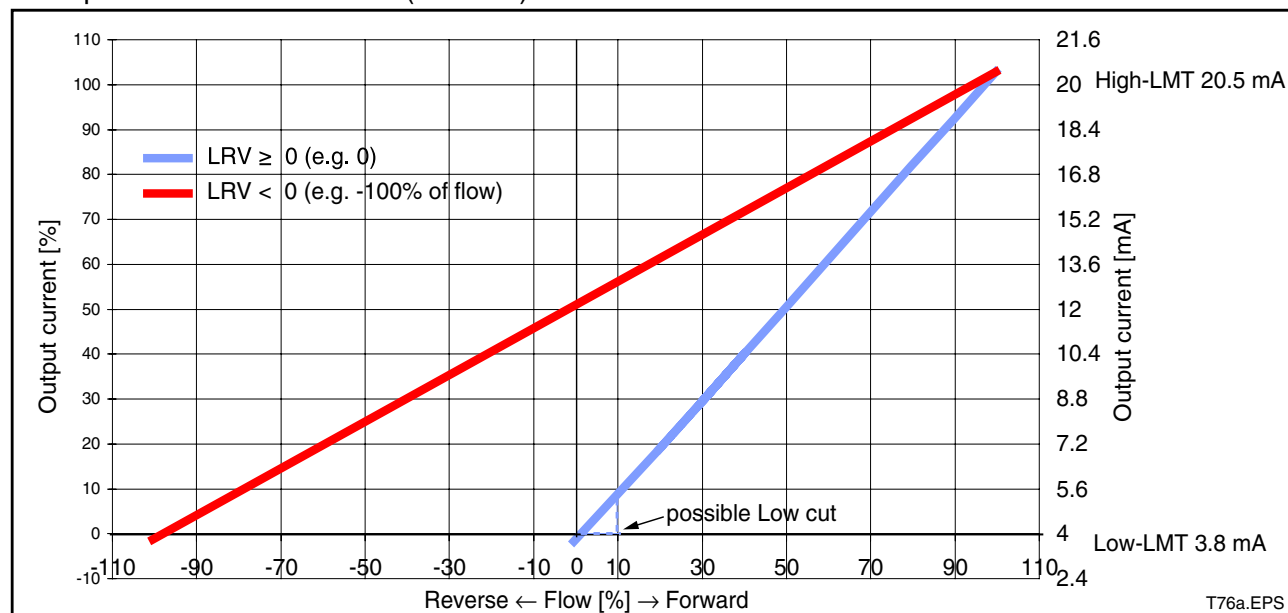
7.9 Velocity functions (Detailed Setup)

Velocity	To set the function of the medium velocity. Not available for gas measurement (/GA)
Velocity unit	Select: m/s, ft/s

7.10 Analog 1 functions (Basic or Detailed Setup)

Analog output 1	To set the current output 1. This output provides HART communication.
Analog 1 select	Select: Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6) Numbers may be displayed if selected via HART. If None is selected, output is 4 mA, HART communication is available.
Analog 1 alarm out (Detailed setup, configure output/input)	If NAMUR is selected (meter without option /NA): <3.6 mA, >21 mA, Hold, Measured value If NOT NAMUR is selected (meter with option /NA): <2.4 mA, <3.6 mA, <4 mA, >21 mA, >21.6 mA
Analog 1 low LMT (low limit) (Detailed setup, configure output/ input) The alarm is active if the measured value is lower than the low limit.	If NAMUR is selected (meter without option /NA): Measuring range from 3.8 - 20.5 mA Alarm level: < 3.6 mA or > 21.0 mA If NOT NAMUR is selected (meter with option /NA): Measuring range from 2.7 - 21.3 mA Alarm level: < 2.4 mA or > 21.6 mA
Analog 1 high LMT (high limit) (Detailed setup, Configure output/ input) The alarm is active if the measured value is higher than the high limit.	If NAMUR is selected (meter without option /NA): Measuring range from 3.8 - 20.5 mA Alarm level: < 3.6 mA or > 21.0 mA If NOT NAMUR is selected (meter with option /NA): Measuring range from 2.7 - 21.3 mA Alarm level: < 2.4 mA or > 21.6 mA

Example for Bi-directional flow (NAMUR):



7.11 Analog 2 functions (Basic or Detailed Setup)

Analog output 2	To set the current output 2.
Analog 2 select	Select: Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6) Numbers may be displayed if selected via HART. If None is selected, output is 4 mA.
Analog 2 alarm out (Detailed setup, configure output/input)	If NAMUR is selected (meter without option /NA): <3.6 mA, >21 mA, Hold, Measured value If NOT NAMUR is selected (meter with option /NA): <2.4 mA, <3.6 mA, <4 mA, >21 mA, >21.6 mA
Analog 2 low LMT (low limit) (Detailed setup, configure output/input) The alarm is active if the measured value is lower than the low limit.	If NAMUR is selected (meter without option /NA): Measuring range from 3.8 - 20.5 mA Alarm level: < 3.6 mA or > 21.0 mA If NOT NAMUR is selected (meter with option /NA): Measuring range from 2.7 - 21.3 mA Alarm level: < 2.4 mA or > 21.6 mA
Analog 2 high LMT (high limit) (Detailed setup, Configure output/input) The alarm is active if the measured value is higher than the high limit.	If NAMUR is selected (meter without option /NA): Measuring range from 3.8 - 20.5 mA Alarm level: < 3.6 mA or > 21.0 mA If NOT NAMUR is selected (meter with option /NA): Measuring range from 2.7 - 21.3 mA Alarm level: < 2.4 mA or > 21.6 mA

7.12 Pulse/Status output 1 functions (Basic or Detailed Setup)

Pulse/Status out 1	To set the pulse/status output 1.
Pulse/Stat 1 select	Select: Pulse out, Status out, No function If Pulse is selected, Status out 1 (SO) is not available. If Status out is selected, pulse parameters are not available.
Pulse 1 select	Select: Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6), F-Total mass (7), R-Total mass (8), F-Total volume (9), R-Total volume (10), F-Total net (11), R-Total net (12) Numbers may be displayed if selected via HART. If F-Total mass, F-Total volume or F-Total net are selected, pulse output only works at forward flow. If R-Total mass, R-Total volume or R-Total net are selected, pulse output only works at reverse flow.
 NOTE To select the pulse output mass or volume has to be selected. If mass flow or volume flow is selected the output delivers only frequency.	Select: Hz, g/P, kg/P, t/P, lb/P, cm³/P, l/P, m³/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, klmpgal/P, l(N)/P, m³(N)/P, SI/P, Scuft/P, Sm³/P If Pulse 1 select is Mass flow, Volume flow, Density, Temperature or Concentration meas, only Hz can be selected. If Pulse 1 select is F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net or R-Total net only unit/P can be selected. l(N)/P, m³(N)/P only for gas application. SI/P, Scuft/P, Sm³/P only for gas application or if reference density value is selected.
Pulse 1 rate	The Pulse rate can be set according to the unit set in Pulse 1 unit . Maximum pulse rate is 10000 Hz.
Pulse 1 active mode	Select: On Active, Off Active The output levels depending on this parameter are shown on page 7-91.
Pulse 1 width	Select: 0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms, 100ms, 500ms, 1000ms
Pulse 1 at alarm	Select: 0P/0Hz, Measured value, Hold If 0P/0Hz is selected, in case of alarm the pulse output is stopped. If Measured value is selected, the pulse output keeps on measuring. If Hold is selected, the pulse output keeps the value before entering the alarm/error state.

7. PARAMETER DESCRIPTION

SO 1 function	Select: No Function, Flow direction, Total limit switch, Mass flow alm 1, Mass flow alm 2, Mass flow alm 1+2, Vol flow alm 1, Vol flow alm 2, Vol flow alm 1+2, Density alm 1, Density alm 2, Density alm 1+2, Temp alm 1, Temp alm 2, Temp alm 1+2, Concentration meas alm 1, Concentration meas alm 2, Concentration meas alm 1+2, Net flow alm 1, Net flow alm 2, Net flow alm 1+2, Slug alarm, Empty alarm, Corrosion alarm, All alarms, All errors, All alarms & errors If Flow direction is selected, status output becomes active for forward flow and not active for reverse flow, if parameter flow direction set to forward. It is the other way round, if parameter flow direction is set to reverse (see 7.17). If Total limit switch is selected, status output becomes active, when the totalizer reaches the value set to parameter Total limit switch (see 7.17). If an alarm function is selected, status output becomes active, if the concerning alarm occurs. If All alarms is selected, status output becomes active, if at least one alarm occurs. The same applies for errors with the setting All errors. For All alarms & errors the status output becomes active, if at least one alarm or one error occurs.
SO1 active mode	Select: On Active, Off Active The output levels depending on this parameter are shown on page 7-91.

How to set status, pulse or frequency output
(using the display keys, equivalent via HART)

Status

Basic Setup or **Detailed Setup**

Pulse/Status out 1

Pulse/Stat 1 select

Select : **Status out**

Pulse or Frequency

Basic Setup or **Detailed Setup**

Pulse/Status out 1

Pulse/Stat 1 select

Select : **Pulse**

Pulse 1 select

F-Total mass → **Pulse**

R-Total mass → **Pulse**

F-Total volume → **Pulse**

R-Total volume → **Pulse**

F-Total net → **Pulse**

R-Total net → **Pulse**

Mass Flow → **Frequency**

Volume Flow → **Frequency**

Net Flow → **Frequency**

Density → **Frequency**

Temperature → **Frequency**

Concentration meas. → **Frequency**

Notice : By selecting a variable (mass or volume) which can be totalized automatically the pulse output is selected.

If **Pulse** is selected, under **Basis Setup** the

Pulse unit and

Pulse rate

have to be defined.

Under 'Detailed Setup'

Pulse unit

Pulse rate

Pulse active mode and

Pulse width

have to be defined.

If the pulse output is set under **Basic Setup**, the pulse width is the width set under **Detailed Setup**. If the pulse width is not configured under **Detailed Setup** menu the **pulse width** will be set default to 1ms.

If 'frequency' is selected the frequency generated at URV (upper range value) has to be defined. Default is URV = 1000Hz.

Differences between Pulse and Frequency output

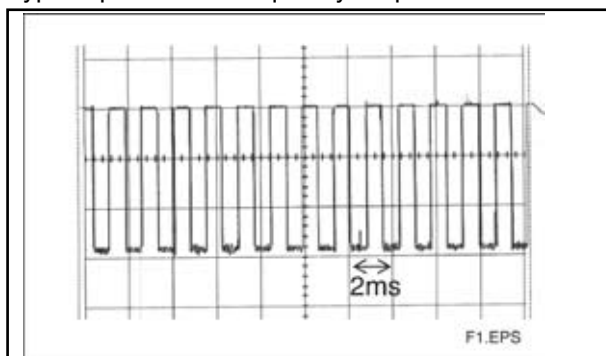
For pulse output the mass (or volume) is internally totalized and if the increment is reached, one pulse is sent.

For a frequency output the measured value is calculated in actual frequency according to the definition of the user (e.g. 10000 Hz = 54321 kg/h) with 50% duty cycle.

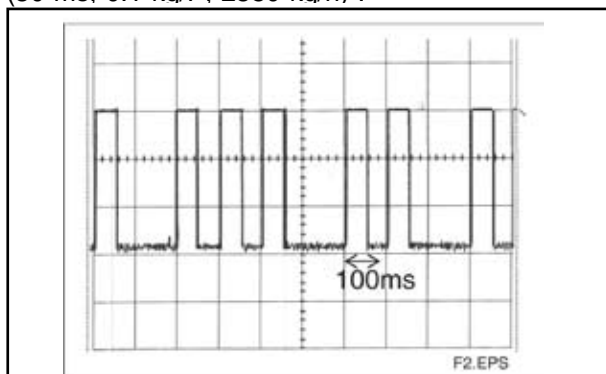
Set as frequency output the pulse length is changing with the change of the measured value.

Set as a pulse output the pulse length is constant but the time between the pulses varies. Even at constant flow the time between the pulses might vary because the microprocessor has to find a suitable gap in its timing to send the pulse.

Typical pattern for frequency output :



Typical pattern for pulse output
(50 ms; 0.1 kg/P; 2580 kg/h) :



Setting the pulse output

Because the duty cycle of pulses is max. 50%, the max. flowrate is restricted by the pulse width, the unit and the pulse rate :

Max. flow rate =
 $1s / (\text{pulse width} \times 2) \times \text{pulse rate} \times \text{time factor}$

Example :

Max. Q should be calculated in kg/min

Pulse width = 50 ms

Pulse rate = 0.1 kg/P

Time factor (related to s) = 60 P/min

Max. Q = $1s / (0.05s \times 2) \times 0.1kg/P \times 60P/min = 60kg/min$

If the flow is higher than max.Q pulses will be lost. Therefore it is mandatory to choose the pulse width/rate so, that the calculated max. Q is always 10% higher than the maximum expected flowrate.

10% higher is recommended because the duty cycle is not always exact 50%. For certain pulse widths the duty cycle at max.Q is larger than 50% so fewer pulses can be generated. These pulses are delivered later when the flowrate is again below max.Q minus 10%. To avoid this situation it is recommended to keep the flowrate always 10% below max.Q.

Example :

Flowrate : 11 t/h

Pulse unit : kg

Pulse rate : 0.1 kg/P

Time factor (related to s) = 3600 P/h

Check :

Lowest pulse width

= $0.5 s \times \text{pulse rate} \times \text{time factor} / \text{max. flow rate}$
 = $0.5 s \times 0.1 kg/P \times 3600 P/h / (11000 kg/h)$
 = 16.4 ms

→ customer should select 10 ms pulse width or lower.

Max. Q = 18000 kg/h

11000 kg/h < 18000 kg/h - 10%

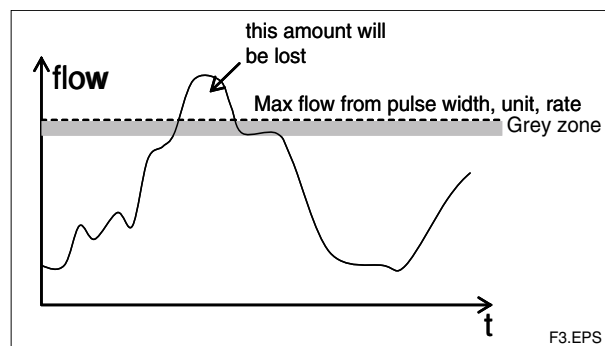
Result :

Pulse width = 10 ms

Pulse rate = 0.1 kg/P

For a first orientation the max. Q for certain pulse widths and units for a pulse rate of 0.1, 1 and 10 are given in the table 7-1.

Max. flow restriction :



7. PARAMETER DESCRIPTION

Table 7-1: Max. flowrate for different pulse settings reduced by 10%:

		Pulse Width in ms									
		1000	500	100	50	10	5	1	0.5	0.1	0.05
		Max. pulse sending frequency for the different pulse settings in P/s									
		0.45	0.9	4.5	9	45	90	450	900	4500	9000
Pulse Unit	Pulse rate	Maximum Flow Rate *									
g	0.1	162 g/h	324 g/h	1.62 kg/h	3.24 kg/h	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h
g	1	1.62 kg/h	3.24 kg/h	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h
g	10	16.2 kg/h	32.4 kg/h	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h
kg	0.1	162 kg/h	324 kg/h	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h
kg	1	1.62 t/h	3.24 t/h	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---
kg	10	16.2 t/h	32.4 t/h	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---	---	---
t	0.1	162 t/h	324 t/h	1620 t/h	3240 t/h	16200 t/h	---	---	---	---	---
t	1	1620 t/h	3240 t/h	16200 t/h	---	---	---	---	---	---	---
t	10	16200 t/h	---	---	---	---	---	---	---	---	---

*) Maximum Flow rate is also limited by sensor size

The following tables show the physical output levels of the pulse / status outputs depending on the setting of parameter Pulse 1/2 active mode or SO 1/2 active mode.

On active				
Output	Situation	Output transistor	Level Pout+	Level Pout+
			Passive	Active (/AP)
Pulse/Status out 1	No Alarm/No Pulse	open (OFF)	High (Us)*	High (15 VDC)
	Alarm/Pulse	closed (ON)	Low (≤ 1 V)	Low (≤ 1 V)
			Level Sout+	
Pulse/Status out 2	No Alarm/No Pulse	open (OFF)	High (Us)*	
	Alarm/Pulse	closed (ON)	Low (≤ 1 V)	

Off active				
Output	Situation	Output transistor	Level Pout+	Level Pout+
			Passive	Active (/AP)
Pulse/Status out 1	No Alarm/No Pulse	closed (ON)	Low (≤ 1 V)	Low (≤ 1 V)
	Alarm/Pulse	open (OFF)	High (Us)*	High (15 VDC)
			Level Sout+	
Pulse/Status out 2	No Alarm/No Pulse	closed (ON)	Low (≤ 1 V)	
	Alarm/Pulse	open (OFF)	High (Us)*	

*) Us is the external power supply voltage of the pulse / status output

7.13 Pulse/Status output 2 functions (Basic or Detailed Setup)

Pulse/Status out 2	To set the pulse/status output 2.
Pulse/Stat 2 select	Select: Pulse out, Status out, No function If Pulse is selected, Status out 2 (SO) is not available. If Status out is selected, pulse parameters are not available.
Pulse 2 select	Select: Mass flow (0), Volume flow (1), Density (2), Temperature (3), Concentration meas (4), Net flow (5), None (6), F-Total mass (7), R-Total mass (8), F-Total volume (9), R-Total volume (10), F-Total net (11), R-Total net (12) Numbers may be displayed if selected via HART. If F-Total mass, F-Total volume or F-Total net are selected, pulse output only works at forward flow. If R-Total mass, R-Total volume or R-Total net are selected, pulse output only works at reverse flow.
Pulse 2 unit  NOTE To select the pulse output mass or volume has to be selected. If mass flow or volume flow is selected the output delivers only frequency.	Select: Hz, g/P, kg/P, t/P, lb/P, cm³/P, l/P, m³/P, gal/P, kgal/P, Cuft/P, bbl/P, Impgal/P, kImpgal/P, l(N)/P, m³(N)/P, SI/P, Scuft/P, Sm³/P If Pulse 2 select is Mass flow, Volume flow, Density, Temperature or Concentration meas, only Hz can be selected. If Pulse 2 select is F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net or R-Total net only unit/P can be selected. l(N)/P, m³(N)/P only for gas application. SI/P, Scuft/P, Sm³/P only for gas application or if Reference density value is selected.
Pulse 2 rate	The Pulse rate can be set according to the unit set in Pulse 2 unit . Maximum pulse rate is 2000 Hz.
Pulse 2 active mode	Select: On Active, Off Active The output levels depending on this parameter are shown on page 7-91.
Pulse 2 width	Select: 0.05ms, 0.1ms, 0.5ms, 1ms, 5ms, 10ms, 50ms, 100ms, 500ms, 1000ms
Pulse 2 at alarm	Select: 0P/0Hz, Measured value, Hold If 0P/0Hz is selected, in case of alarm the pulse output is stopped. If Measured value is selected, the pulse output keeps on measuring. If Hold is selected, the pulse output keeps the value before entering the alarm/error state.

SO 2 function	Select: No Function, Flow direction, Total limit switch, Mass flow alm 1, Mass flow alm 2, Mass flow alm 1+2, Vol flow alm 1, Vol flow alm 2, Vol flow alm 1+2, Density alm 1, Density alm 2, Density alm 1+2, Temp alm 1, Temp alm 2, Temp alm 1+2, Concentration meas alm 1, Concentration meas alm 2, Concentration meas alm 1+2, Net flow alm 1, Net flow alm 2, Net flow alm 1+2, Slug alarm, Empty alarm, Corrosion alarm, All alarms, All errors, All alarms & errors If Flow direction is selected, status output becomes active for forward flow and not active for reverse flow, if parameter flow direction set to forward. It is the other way round, if parameter flow direction is set to reverse (see 7.17). If Total limit switch is selected, status output becomes active, when the totalizer reaches the value set to parameter Total limit switch (see 7.17). If an alarm function is selected, status output becomes active, if the concerning alarm occurs. If All alarms is selected, status output becomes active, if at least one alarm occurs. The same applies for errors with the setting All errors. For All alarms & errors the status output becomes active, if at least one alarm or one error occurs.
SO2 active mode	Select: On Active, Off Active The output levels depending on this parameter are shown on page 7-91.

Detailed information about using the pulse and status output see chapter 7.12.

7.14 Status input functions (Basic or Detailed Setup)

Status input	To set the status input .
SI function	Select: No function, Autozero Reset flex totals, Reset mass totals, Reset volume totals, Reset net totals, Reset all totals, 0% signal lock If Autozero is selected, active status input starts autozero procedure. If parameter Total reset cntrl is enabled: - If Reset flex totals is selected, active status input sets flex totalizer to zero. - If Reset mass totals is selected, active status input sets mass totalizer to zero. - If Reset volume totals is selected, active status input sets volume totalizer to zero. - If Reset net totals is selected, active status input sets net totalizer to zero. - If Reset all totals is selected, active status input sets all totalizer to zero.
SI active mode	Select: On Active, Off Active If On Active is selected, the status input is closed active. If Off Active is selected, the status input is open active.

7.15 HART output (Detailed Setup)

HART output	To set the assignments of HART device variables which are reported via HART Universal Command 3.
PV is	Set the assignment of Primary variable (PV). PV is linked to Analog output 1. Changing of PV will change the assignment of Analog output 1 and vice versa. Select: Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None
SV is	Set the assignment of Secondary variable (SV). SV is linked to Analog output 2. Changing of SV will change the assignment of Analog output 2 and vice versa. Select: Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None If Analog output 2 is not available (option /KF2) an extended selection is available, see "HART Variable list" below.
TV is	Set the assignment of Tertiary variable (TV). TV is linked to Pulse output 1 if Pulse/Stat 1 sel is set to Pulse. In this case changing of TV will change the assignment of Pulse output 1 and vice versa. Select: Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net If Pulse/Stat 1 sel is set to Status out or No function an extended selection is available, see "HART Variable list" below . This selection is stored separately from the selection for "Pulse".
QV is	Set the assignment of Quaternary variable (QV). QV is linked to Pulse output 2 if Pulse/Stat 2 sel is set to Pulse. In this case changing of QV will change the assignment of Pulse output 2 and vice versa. Select: Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net If Pulse output 2 is not available (option /KF2) or Pulse/Stat 2 sel is set to Status out or No function an extended selection is available, see "HART Variable list" below. This selection is stored separately from the selection for "Pulse".
HART Variable list (For HART- communication: Variables which are not allowed will be rejected by "Invalid Selection")	Mass flow, Volume flow, Density, Temperature, Concentration meas, Net flow, None, F-Total mass, R-Total mass, F-Total volume, R-Total volume, F-Total net, R-Total net, F-Total flex, R-Total flex, D-Total mass, D-Total volume, D-Total net, D-Total flex, F-Total energy, Velocity, Drive Gain

7.16 Totalizer functions (Basic or Detailed Setup)

Totalizer	To set totalizer function. Totalizer increments the forward flow if flow direction is forward or the reverse flow if flow direction is reverse.
Total flex select	Flex totalizer is available as a secondary total for mass, volume or net. Select: Mass, Volume, Net If assignment is changed Flex totalizer will be set to zero, Total flex unit will be set to default.
Total flex unit	When Total flex select is set to Mass or Net , the Total flex unit g, kg, t, lb can be selected. When Total flex select is set to Volume or Net , the Total flex unit cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, klmpgal, l(N), m³(N), SI, Scuft, MMscuft, Sm³ can be selected. l(N), m³(N) only for gas application. SI, Scuft, MMscuft, Sm³ only for gas application or if Reference density value is selected.
Total mass unit	Select: g, kg, t, lb
Total volume unit	For Total volume unit cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, klmpgal, l(N), m³(N), SI, Scuft, MMscuft, Sm³ can be selected. l(N), m³(N) only for gas application. SI, Scuft, MMscuft, Sm³ only for gas application or if Reference density value is selected.
Total net unit	For option /CST: When Net flow select is set to Mass , the Total net unit g, kg, t, lb can be selected. When Net flow select is set to Volume , the Total net unit cm³, l, m³, gal, kgal, Cuft, bbl, Impgal, klmpgal can be selected. For option /Cxx: Selection depends from concentration unit.
Total energy unit	Select: MJ, Btu
Energy factor/Heat of combustion	Set the calorific value of the medium with the unit Energy factor/Heat of combust. unit. The totalized energy of the medium can be indicated on display by F-Total energy. Heat of combust. unit MJ/kg, Btu/lb, MJ/m³(N) and Btu/Scuft can be selected.
Total switch select	Select: Flex Total, Mass Total, Volume Total, Net Total
Total limit switch	A totalizer limit can be set only to the forward totalizer selected in Total select . If status output is set to Total switch , status output is set active, if the totalizer reaches this value. Total switch is not active if set to 0.0.
Total at alarm	Select: Hold, Continue Total Characteristic of totalizer selected in Total select in case of the Total switch is active. If Hold is selected forward and reverse totalising stops.
Total reset cntrl	Select: Inhibit, Enable Enables or inhibits total reset.

Total reset	Select: Not Execute, Reset flex totals, Reset mass totals, Reset volume totals, Reset net totals, Reset all totals After execution of reset totals, forward and reverse total of the selected totalizer will be set to zero.
If the total value 9999999 is reached, the indication changes to exponential type. During exponential indication the resolution is lower. If full accuracy is needed, total reset must be executed to reach precise indication.	

7.17 Flow direction function (Detailed Setup)

Flow direction	Select: Forward, Reverse See 7.12 and 7.13 according influence on status output (SO 1/2 function = Flow direction) If Reverse is selected, the flow direction in the other direction of the arrow on the detector is used as positive values of flow.
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7.18 Concentration measurement (Detailed Setup)

Concentration meas (only for option/CST or /Cxx)	To set the functions of concentration measurement. For xx=00 to 99 a customer specific or defined table is stored in the converter in factory. For /CST temperature coefficients have to be determined by the customer.
Concentration meas unit (only available for option/CST)	Select: °Brix, Wt-% sol, Vol% sol, Wt-%, Vol%
Concentration meas format	Select: xxxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
Concentration meas LRV (low range value)	Set a concentration value to the 4 mA or 0 Hz
Concentration meas (upper range value)	Set a concentration value to the 20 mA or xxxxx = Hz. Abs(URV-LRV) ≥ 10%
Concentration meas damping	Set the damping time in s. Damping time affects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Concentration meas lowcut	Set the low cut. Low cut affects outputs and display.
Concentration meas alm 1 sel	Select: No function, More than, Less than
Concentration meas alm 1 crit	Select a concentration alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Concentration meas alm 2 sel	Select: No function, More than, Less than
Concentration meas alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a concentration alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13).
Concentration meas setup (only for option /CST)	To setup the coefficients used for calculation of concentration using the Standard Concentration Measurement.
Reference temperature	Set the temperature where the reference density of both components of the mixture has been determined.
Ref. density carrier	Set the density of the carrier liquid determined at the reference temperature.
Temp. coeff. a carrier	Set the linear temperature coefficient of the density of the carrier liquid.
Temp. coeff. b carrier	Set the squared temperature coefficient of the density of the carrier liquid.
Ref. density product	Set the density of the product determined at the reference temperature.
Temp. coeff. a product	Set the linear temperature coefficient of the density of the product.
Temp. coeff. b product	Set the squared temperature coefficient of the density of the product.
For more information on concentration measurement see TI "Concentration Measurement" TI 01R04B04-04E-E.	

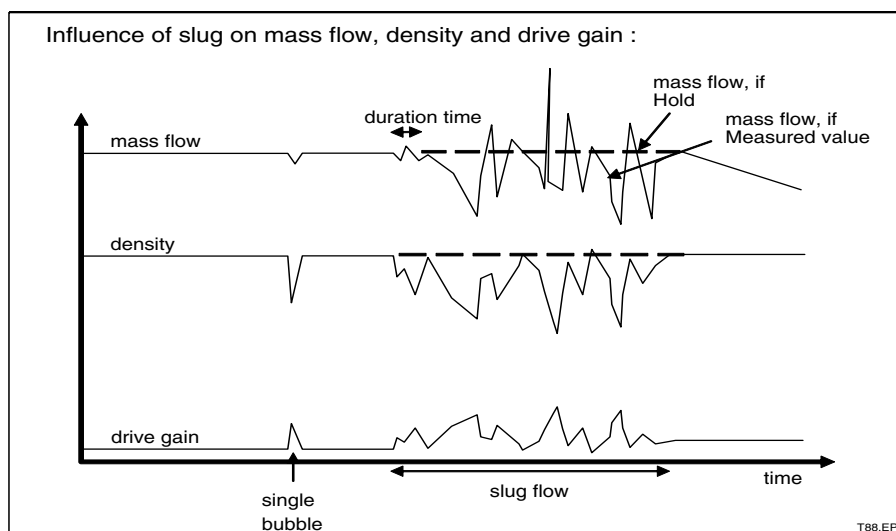
7.19 Net flow (Detailed Setup)

Net flow	To set the functions of net flow measurement. Net flow is only available if concentration measurement is activated (option /Cxx).
Net flow select (only available for option /CST)	Select: Mass, Volume
Net flow unit	When Net flow select is set to Mass : g/s, g/min, g/h, kg/s, kg/min, kg/h, kg/d, t/min, t/h, t/d, lb/s, lb/min, lb/h, lb/d can be selected When Net flow select is set to Volume : cm³/s, cm³/min, cm³/h, l/s, l/min, l/h, l/d, m³/s, m³/min, m³/h, m³/d, gal/s, gal/min, gal/h, gal/d, Cuft/s, Cuft/min, Cuft/h, Cuft/d, bbl/s, bbl/min, bbl/h, bbl/d, Impgal/s, Impgal/min, Impgal/h, Impgal/d can be selected
Net flow format	Select: xxxxxxx, xxxxx.X, xxxx.XX, xxx.XXX, xx.XXXX, x.XXXXX
Net flow LRV (low range value)	Set a net flow value to the 4 mA or 0 Hz.
Net flow URV (upper range value)	Set a net flow value to the 20 mA or xxxxx = Hz. Abs(URV-LRV) ≥ 5% of Qnom.
Net flow damping	Set the damping time in s. Damping time effects outputs and display. After 5 times damping time the given value is displayed (t=63%).
Net flow lowcut	Set the low cut effects output and display. A hysteresis of 0.05% of Qnom is given by the system.
Net flow alm 1 sel	Select: No function, More than, Less than
Net flow alm 1 crit	Select a net flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13)
Net flow alm 2 sel	Select: No function, More than, Less than
Net flow alm 2 crit Restrictions: All alarms have to be in 0-110% of URV-LRV Alarm criteria 2 must always be larger than alarm criteria 1.	Select a net flow alarm level. What happens in case of an alarm has to be defined in Status out (7.12, 7.13)

7.20 Slug detection (Detailed Setup)

Slug detection	Detection of bubble flow. Not available if gas measurement is ordered. After slug criteria has been reached, slug is supervised during slug duration. If slug is still detected after slug duration has expired, the selected action in After slug is taken. See below table.
Slug alarm select	Select: Not apply, Apply
Drive gain	To read drive gain. To set a suitable slug criteria the customer must know the drive gain level of normal flow condition and of slug flow condition. This function is suitable to evaluate this level.
Slug criteria	Above this drive gain level slug flow is assumed.
Slug duration	Duration time is designed to ignore short gas bubbles. Only after Slug duration has expired the setting in After slug will be taken in account. In normal slug application set slug duration to zero.
After slug	Select: Measured value, Hold If Hold is selected mass flow and density keep their value before occurrence of the slug alarm and as long as slug alarm is detected.
Drive gain damping	Set drive gain damping time to get a constant drive gain level.

Gas application?				
Yes	No			
Slug detection off	Slug alarm select = Apply?			
	Yes			No
	Drive gain > Slug criteria?			Slug detection off
	Yes		No	
	Duration active?			
	Yes	After duration		
	Function active Alarm off Measurement continued	Slug detection On Alarm on Measurement continued or value hold	Slug detection off Alarm off	



7.21 Empty pipe detection (Detailed Setup)

Empty pipe detection			Detection of empty pipe		
Not available if gas measurement (option /GA) is ordered			After Empty pipe crit has been reached, alarm output is activated if selected. This function can also be used to detect tube failure (see chapter 8.8).		
Empty pipe alm sel			Select: Not apply, Apply		
Empty pipe crit			Set density value as criteria when empty pipe alarm should happen. If Empty pipe crit is smaller than Density URV (or LRV, whichever is higher), alarm appears if density is lower than Empty pipe crit . If Empty pipe crit is equal or greater than Density URV (or LRV, whichever is higher), alarm appears if density is higher than Empty pipe crit .		
After empty pipe			Select the behaviour of the outputs after empty pipe has happened. Select: Massflow = Zero, Measured Value, Hold With this function the outputs can be set to zero if the detector runs empty during maintenance. It is also useful for batching if the batch starts with an empty pipe. In such case please install the detector vertically.		
Gas application?					
Yes		No			
		Empty pipe alm sel = Apply?			
		Yes			No
		Empty pipe crit < Density URV? (or LRV, whichever is higher)		Empty pipe crit ≥ Density URV? (or LRV, whichever is higher)	
		Yes	No	Yes	No
Empty pipe OFF	Empty pipe ON	Empty pipe OFF	Empty pipe ON	Empty pipe OFF	Empty pipe OFF
Alarm off	Alarm On if density < empty pipe crit	Alarm off	Alarm On if density ≥ empty pipe crit	Alarm off	Alarm off
	Outputs either Measured Value, Hold or 4mA/0Hz		Outputs either Measured Value, Hold or 4mA/0Hz		

7.22 Corrosion detection (Detailed Setup)

Corrosion detection	Detection of corrosion in pipe. Not available if gas measurement is ordered. Not working if a fixed density value is set. This function is useful if the maximum density of the fluid is known and corrosion may happen. As alternative to this function the user can watch density periodically. After density value stored in Corrosion crit has been reached, alarm output is activated if selected. This function is only good for liquids with relative constant density. Set an upper density level. If this density level is reached permanently, a warning occurs.
Corrosion alm sel	Select: Not apply, Apply
Corrosion crit	Set density value up to Density URV or Density LRV (whichever is higher)
Corrosion damp	Set damping on density for comparison with Corrosion crit , up to 10h.

7.23 Detector data (Detailed Setup)

The sensor model is defined in Parameter Detailed Setup / Sensor model :



WARNING

The function Sensor model is only for changing a converter in case of maintenance. Never change the sensor model if the sensor is not changed.

The sensor constants for the selected detector are stored in parameters Detailed Setup / Sensor constants. You find the main sensor constants on the name plate. In case of doubt of the measured value please confirm that the proper sensor constants are stored.

The serial number of the converter is stored in 'Detailed Setup / Device Information / Serial no. Converter'. The serial number of the detector is stored in 'Detailed Setup / Device Information / Serial no. Detector'. For compact version RCCT3 there is only one serial number.

The tag number, if provided by the customer (option /BG), is stored in Basic setup / Tag.

For integral type RCCT3x and remote type RCCF31 / RCCR31 combined ordered with RCCS3x the detector data are factory stored in the concerning parameters. For not combined remote type RCCF31 with option /NC see chapter 5.5.

If the parameter Detailed setup / Sensor model is changed to another type, the following parameters are changed to new default values corresponding to the selected model :

Qnom, Mass flow unit, Mass flow LRV, Mass flow URV, Vol flow unit, Vol flow LRV, Vol flow URV, Autozero range, Autozero fluctuation range and the sensor constants.

In this case the sensor constants, the detector serial number and, if available, the tag number must be set to the values corresponding to the used detector as described above.

7.24 Autozero (Diag/Service)

Autozero	Mass flow zero setting. Please set zero under process conditions after warming up the converter.
Zero tuning	Select: Inhibit, Enable
Autozero time	Select: 3 min, 30 sec Select the duration of autozero performing. Recommended: 3 min
Autozero Exe	Select: Execute, Not Execute If Execute is selected Autozero is started. After autozero execution the autozero value is indicated for 3 seconds and the date should be entered (format: dd/mm/yyyy). Pressing SET stores value, date, temperature and density in autozero history. Note: Autozero function can't be terminated. Autozero value will be calculated and used once the function has been started!
Autozero value	Result of Autozero Exe
Autozero check: Autozero history	Indicates 5 latest autozero values with date of execution, temperature and density during execution (only if date has been entered). This function allows checking the quality of autozero condition and long term zero drift.
Autozero check: Autozero initial	Indicates the factory autozero value
Autozero check: Autozero range	Indicates the typical maximum autozero range. If this range is exceeded during autozero the warning W06 is generated. Check the detector installation!
Autozero check: Autozero fluctuation range Warning: If the sensor model is changed Autozero fluctuation range is zero.	Indicates the factory Autozero fluctuation range determined during calibration. If this range is exceeded during autozero the warning W07 is generated. Check the electrical installation, the plant vibration and the density (is the detector fully filled?).



IMPORTANT

- **Stop flow before starting autozero** (valve on output).
- During autozero time
 - Flow is fixed to zero
 - Totalizer stops counting
 - Display keys do not work

Additional information and how to start autozero and how to read autozero history is described in chapter 5.6 "Zero adjustment".

7.25 Reading maximum fluid temperature (Detailed Setup)

Fluid max. temp	The highest measured medium temperature can be read in this parameter. This parameter can not be reset or changed by the user.
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7.26 Option /GA for Gas Measurement

This option is factory set by order. If this function is selected find the following restrictions:

- Density measurement is not available; the reference density value is always used and displayed.
 - Normal volume flow:
 - Set reference density to normal density.
 - Select normal volume (flow) units for volume, total volume, pulse output.
 - Standard volume flow:
 - Set reference density to standard density.
 - Select standard volume (flow) units for volume, total volume, pulse output.
 - Volume flow:
 - Set reference density to actual density.
 - Select volume (flow) units for volume, total volume, pulse output.
- Corrosion detection is not available.
- Empty pipe detection is not available.
- Slug detection is not available

The instrument is mass balanced with air at normal pressure. It can be used for liquids with reduced accuracy.

The minimum URV-LRV range for mass flow, volume flow and net flow is 1% of Qnom.

If Heat of Combustion unit is changed between mass related units (MJ/kg, Btu/lb) and volume related units (MJ/m³(N), Btu/Scuft), there is no conversion of Heat of Combustion value.

In this case, Heat of Combustion has to be set manually to the correct value.

8. SELF-DIAGNOSTIC AND TROUBLE-SHOOTING

8.1 Error descriptions and countermeasure

The self check function displays instrument errors, warnings and alarms.

When an alarm or error occurs, the code (e.g. E-01) and the name (e.g. Frequency fault) appear on the display during display mode, alternating with measuring value indication. This does not happen in parameter setting mode.

The alarms, errors and warnings are written into history, see chapter 9.2.

The following table shows the possible alarms, warnings and error with the concerning influences on outputs and fields variables.

Alarm (A); Warning (W) Error (E)	Name	Flow on Display	Density/Temp. on Display	Totalizer on Display	Analog outputs	Frequ./Pulse-outputs	Status outputs ¹⁾
nc = no change, nd = not defined							
A-01	MF 1 criteria	nc	nc	nc	nc	⁶⁾	Mass flow alm 1 ⁷⁾
A-02	MF 2 criteria	nc	nc	nc	nc	⁶⁾	Mass flow alm 2 ⁷⁾
A-03	VF 1 criteria	nc	nc	nc	nc	⁶⁾	Vol flow alm 1 ⁷⁾
A-04	VF 2 criteria	nc	nc	nc	nc	⁶⁾	Vol flow alm 2 ⁷⁾
A-05	Dens. 1 criteria	nc	nc	nc	nc	⁶⁾	Density alm 1 ⁷⁾
A-06	Dens. 2 criteria	nc	nc	nc	nc	⁶⁾	Density alm 2 ⁷⁾
A-07	Temp. 1 criteria	nc	nc	nc	nc	⁶⁾	Temp alm 1 ⁷⁾
A-08	Temp. 2 criteria	nc	nc	nc	nc	⁶⁾	Temp alm 2 ⁷⁾
A-09	Conc. 1 criteria	nc	nc	nc	nc	⁶⁾	Conc meas alm 1 ⁷⁾
A-10	Conc. 2 criteria	nc	nc	nc	nc	⁶⁾	Conc meas alm 2 ⁷⁾
A-11	Netflow 1 crit.	nc	nc	nc	nc	⁶⁾	Net flow alm 1 ⁷⁾
A-12	Netflow 2 crit.	nc	nc	nc	nc	⁶⁾	Net flow alm 2 ⁷⁾
A-13	Total thr exceed	nc	nc	hold;continue ¹⁾	nc	⁶⁾	Total switch ⁷⁾
A-14	Slug detection	MFL: meas.; hold ⁴⁾	DEN: meas.; hold ⁴⁾	nc	nc	⁶⁾	Slug alarm ⁷⁾
A-15	Empty pipe det.	MFL: meas.; hold ²⁾	nc	nc	nc	⁶⁾	Empty pipe alm ⁷⁾
A-16	Corrosion det.	nc	nc	nc	nc	⁶⁾	Corrosion alm ⁷⁾
W-01	Density low	nc	DEN: 0 kg/l ⁵⁾	nc	nc	nc	nc
W-02	Fixed dens act.	nc	DEN: fix value	nc	nc	nc	nc
W-03	Fixed temp act.	nc	TEMP: fix value	nc	nc	nc	nc
W-04	Fixed MF active	MFL: fix value + act. zero	nc	nc	nc	nc	nc
W-05	Autozero running	nc	nc	nc	nc	nc	nc
W-06	AZ val error	nc	nc	nc	nc	nc	nc
W-07	AZ fluct error	nc	nc	nc	nc	nc	nc
W-08	Sensor simul.	nc	nc	nc	nc	nc	nc
W-09	Fixed Prim Out	nc	nc	nc	4mA	nc	nc
W-10	Prim Out sat.	nc	nc	nc	nc	nc	nc
W-11	Sec Out sat.	nc	nc	nc	nc	nc	nc
W-12	Tert Out sat.	nc	nc	nc	nc	nc	nc
W-13	Quart Out sat.	nc	nc	nc	nc	nc	nc
E-01	Frequency fault	nd	Dens = nd Temp = nc	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾
E-02	Signal fault	nd	nc	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾
E-03	EEPROM fault	nd	nd	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾
E-04	CPU fault	nd	nd	nd	3,6mA... ⁸⁾	nd	nd
E-05	DSP fault	nd	nd	hold	3,6mA... ⁸⁾	⁶⁾	⁷⁾
E-06	Sensor 1 fault	nd	Dens = nd Temp = nc	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾
E-07	Sensor 2 fault	nd	nc	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾
E-08	Temp sens fault	nc	Density = nd Temp = 30°C	hold	3,6mA;... ³⁾	⁶⁾	⁷⁾

¹⁾ Choice of "Total at alarm" (Detailed Setup / Totalizer)

²⁾ Choice of "Output after Empty pipe" (Detailed Setup / Empty pipe detect)

³⁾ Choice of "Analog 1/2 alarm out" (Detailed Setup / Config Output) and NAMUR/NOT NAMUR (Measuring range)

⁴⁾ Choice of "After Slug" (Detailed Setup / Slug detection)

⁵⁾ Only if "Liquid" is selected (Detailed Setup / Liquid/gas selection)

⁶⁾ Choice of "Pulse 1 at alarm" or "Pulse 2 at alarm" (Detailed Setup / Pulse/Status out 1/2)

⁷⁾ Status outputs active if "All Errors" or "All Alarms & Errors" is selected (Detailed Setup / Pulse/Status out 1/2)

⁸⁾ Choice of jumper "Burn-out" (See chapter 8.7.9 Setting "Burn-out" Mode)

*) Status outputs acc. SO 1/2 function and SO 1/2 active mode

8. SELF-DIAGNOSTIC AND TROUBLESHOOTING

The following table shows possible countermeasures :

Alarm (A); Warning (W) Error (E)	Name	Meaning	Description	Countermeasure
A-01	MF 1 criteria	Mass flow L Alarm	Mass flow below MF 1 criteria	Increase mass flow / Change setting
A-02	MF 2 criteria	Mass flow H Alarm	Mass flow above MF 2 criteria	Reduce mass flow / Change setting
A-03	VF 1 criteria	Volume flow L Alarm	Volume flow below VF 1 criteria	Increase volume flow / Change setting
A-04	VF 2 criteria	Volume flow H Alarm	Volume flow above VF 2 criteria	Reduce volume flow / Change setting
A-05	Dens. 1 criteria	Density L Alarm	Density below Dens. 1 criteria	Increase density / Change setting
A-06	Dens. 2 criteria	Density H Alarm	Density above Dens. 2 criteria	Reduce density / Change setting
A-07	Temp. 1 criteria	Temperature L Alarm	Temperature below Temp. 1 criteria	Increase temperature / Change setting
A-08	Temp. 2 criteria	Temperature H Alarm	Temperature above Temp. 2 criteria	Reduce temperature / Change setting
A-09	Conc. 1 criteria	Concentration L Alarm	Concentration below Conc. 1 criteria	Increase concentration / Change setting
A-10	Conc. 2 criteria	Concentration H Alarm	Concentration above Conc. 2 criteria	Reduce concentration / Change setting
A-11	Netflow 1 crit.	Net flow L Alarm	Net flow below Net flow 1 crit.	Increase net flow / Change setting
A-12	Netflow 2 crit.	Net flow H Alarm	Net flow above Net flow 2 crit.	Reduce net flow / Change setting
A-13	Total thr exceed	Total threshold exceed	Totalizer value exceeds total threshold	Reset totalizer / Change setting
A-14	Slug detection	Slug flow detected	Slug criterion is reached	Reduce gas bubbles in medium
A-15	Empty pipe det.	Empty pipe detectd	Empty pipe criterion is reached	Fill pipe
A-16	Corrosion det.	Corrosion detected	Corrosion criterion is reached	Change detector
W-01	Density low	Density lower 0.3 kg/l	Density lower than 0.3 kg/l	Fill the detector with fluid
W-02	Fixed dens act.	Fixed Dens selected	Parameter Dens fix val sel is enabled	Set parameter Dens fix val sel to inhibit
W-03	Fixed temp act.	Fixed Temp selected	Parameter Temp fix val sel is enabled	Set parameter Temp fix val sel to inhibit
W-04	Fixed MF active	Fixed MF selected	Parameter MF fix val sel is enabled	Set parameter MF fix val sel to inhibit
W-05	Autozero running	Autozero is running ...	Autozero process is performed, started by user action or status input	Wait until process stops (30sec or 180sec max)
W-06	AZ val error	Autozero value out of range	Auto zero value is out of the internal detector depending range	Stop flow during auto zero. Check detector installation
W-07	AZ fluct error	Autozero fluctuation out of range	Auto zero fluctuation is out of the internal detector depending range	Stop flow during auto zero. Check electrical installation, vibrations and density.
W-08	Sensor simul.	Sensor simulation active	Fixed frequency or fixed phase difference is enabled	Set Sensor simulation to inhibit
W-09	Fixed Prim Out	Analog output 1 fixed	Analog output 1 fixed at 4mA for multidrop operation	Set HART polling address to 0 (Multidrop operation stops)
W-10	Prim Out sat.	Analog output 1 saturated	Analog output 1 reaches less than 3.8mA or more than 20.5mA	Increase or decrease current level of output 1
W-11	Sec Out sat.	Analog output 2 saturated	Analog output 2 reaches less than 3.8mA or more than 20.5mA	Increase or decrease current level of output 2
W-12	Tert Out sat.	Pulse/Status output 1 saturated	Relation between pulse width and pulse rate of Pulse/Status output 1 is too high	Decrease length of pulse width or increase amount of pulse rate of pulse output 1
W-13	Quart Out sat.	Pulse/Status output 2 saturated	Relation between pulse width and pulse rate of Pulse/Status output 2 is too high	Decrease length of pulse width or increase amount of pulse rate of pulse output 2
E-01	Frequency fault	Frequency fault detected	Driving frequency out of range	Check cable (Remote) and detector
E-02	Signal fault	Signal fault detected	Phase difference out of range	Check cable (Remote) and detector
E-03	EEPROM fault	EEPROM fault detected	CRC-Error	Contact Yokogawa service
E-04	CPU fault	CPU fault detected	Micro processor is not working	Contact Yokogawa service
E-05	DSP fault	DSP fault detected	Micro processor is not working	Contact Yokogawa service
E-06	Sensor 1 fault	Sensor 1 Signal fault detected	Sensor 1 signal below 7% for 3 min	Check cable (Remote) and detector
E-07	Sensor 2 fault	Sensor 2 Signal fault detected	Sensor 2 signal below 7% for 3 min	Check cable (Remote) and detector
E-08	Temp sens fault	Temperature Sensor Fault detected	T<-220°C or T>550°C	Check cable (Remote) and detector Check temperature

8.2 Reading Event + Error History (Diag/Service, Self test/Status)

Event Overview/ Error Alarm Warning	Reads the actual errors, alarms and warnings (EAW). In Event Overview the number of the actual EAWs is shown. In Error , Alarm or Warning the description of the actual events can be found.
Hist Overview in Order	Shows the latest 10 EAWs. By comparing this with Hist Overview abs it can be checked if certain EAWs have vanished.
Hist Overview in Order/ Clear History	Select: Execute , Non execute If Execute is selected the latest 10 EAWs are cleared.
Hist Overview abs/ Error Alarm Warning	In Hist Overview abs the number of EAWs after the last clearance can be viewed. In Error , Alarm or Warning the description of the events after the last clearance can be found.
Hist Overview abs/ Clear History	Select: Execute , Not Execute If Execute is selected the user is asked to fill in a date (mm/dd/yyyy). If a date is set the errors and warnings are stored in the Error history with this date.
Error History	In Error History the number of EAWs of the last clearance of the Hist Overview abs can be viewed. In Error or Warning the description of the events can be found. The last 10 entries can be selected by date.

8.3 Self test (Diag/Service)

Self test/ Status	Select: Self test , Status If Self test is selected, all error and alarm status are checked. If Status is selected, the existing errors and alarms are indicated in succession.
-------------------	---

8.4 Signal- and I/O-Test (Diag/Service)

Input/Output test	These functions enable you to simulate the I/O signals (loop test). The outputs can be checked with a multimeter. Refer to the connecting diagrams in chapter 4.8.6. The test can be cancelled by pressing any key.
Analog output 1 Analog output 2 Pulse output 1 Status output 1 Pulse output 2 Status output 2 Status input	Setting range: 2 to 22 mA Setting range: 2 to 22 mA Setting range: 0 to 10000 Hz Setting range: On Active or Off Active Setting range: 0 to 2000 Hz Setting range: On Active or Off Active Indication range: Open or Short

8.5 Output trim

Output trim	With this function the 4 mA and the 20 mA can be adjusted if required
AO 1 trim 4mA / AO 1 trim 20mA	The analog output 1 is set to the 4 mA or 20 mA. Connect a load resistor between 20 and 600 Ω and measure the output current. This current value must be entered on request on display. The deviation to 4 mA is corrected by the converter itself.
AO 2 trim 4mA / AO 2 trim 20mA	The analog output 2 is set to the internal 4 mA or 20 mA value. Connect a load resistor between 20 and 600 Ω and measure the output current. This current value must be entered on request on display.

8.6 Detector cleaning



CAUTION

For integral type : Ambient temperature may not exceed 55°C !

The equipment can be CIP-cleaned. Steam below 230°C is not a problem. However, you should take care that the cleaning operation does not last so long that the converter temperature exceed 55°C. Switch power off during cleaning.

8.7 Troubleshooting



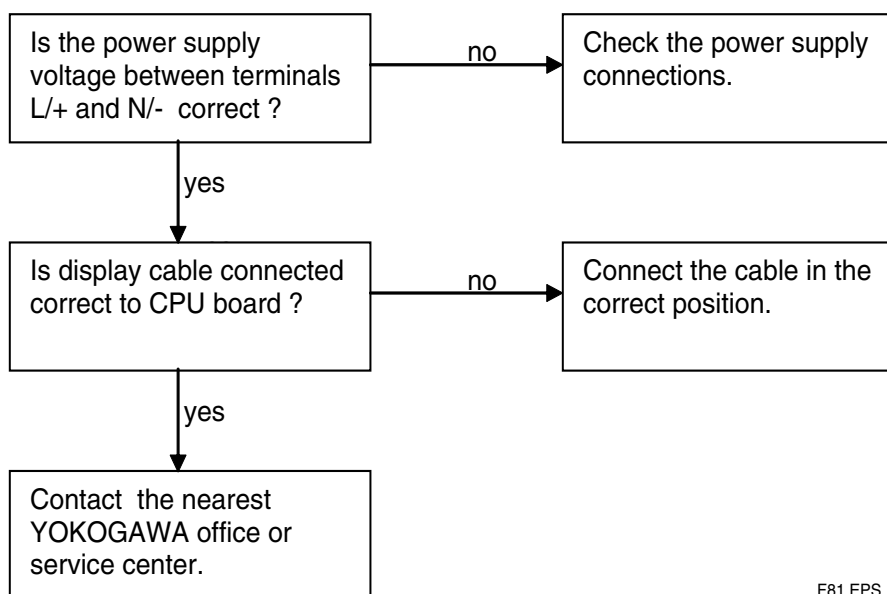
IMPORTANT

If the indicated countermeasures do not remedy the fault or in case of troubles which can not be remedied by the user, please contact your Yokogawa service centre.

If there is an error, alarm or warning displayed, deal with the error according to 8.1 „Error descriptions and countermeasure“.

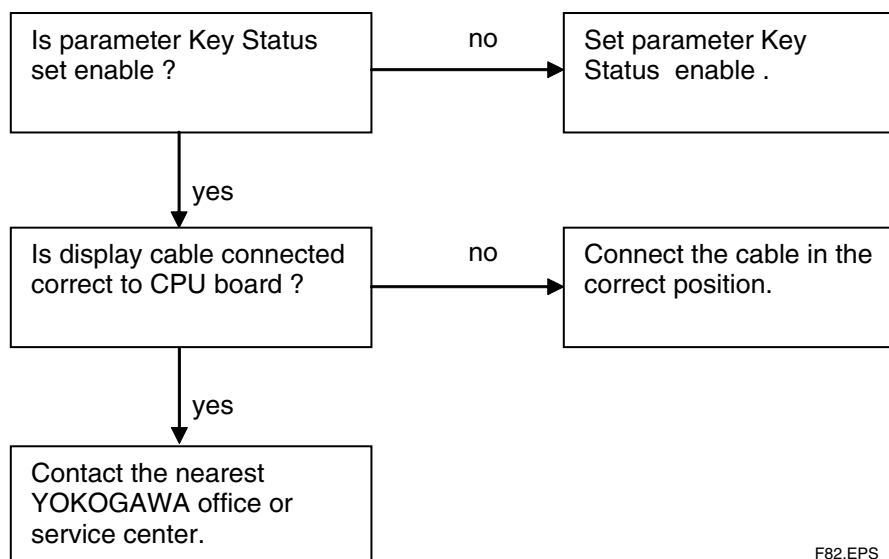
In the following some problems are listed which may not be indicated as error, alarm or warning. First make sure, that no error, alarm or warning is displayed.

8.7.1 No indication



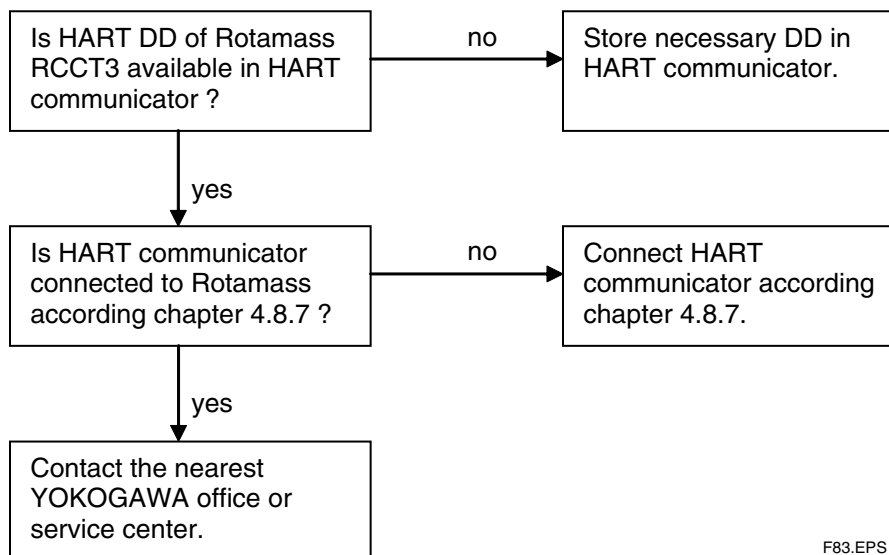
F81.EPS

8.7.2 No key-setting possible



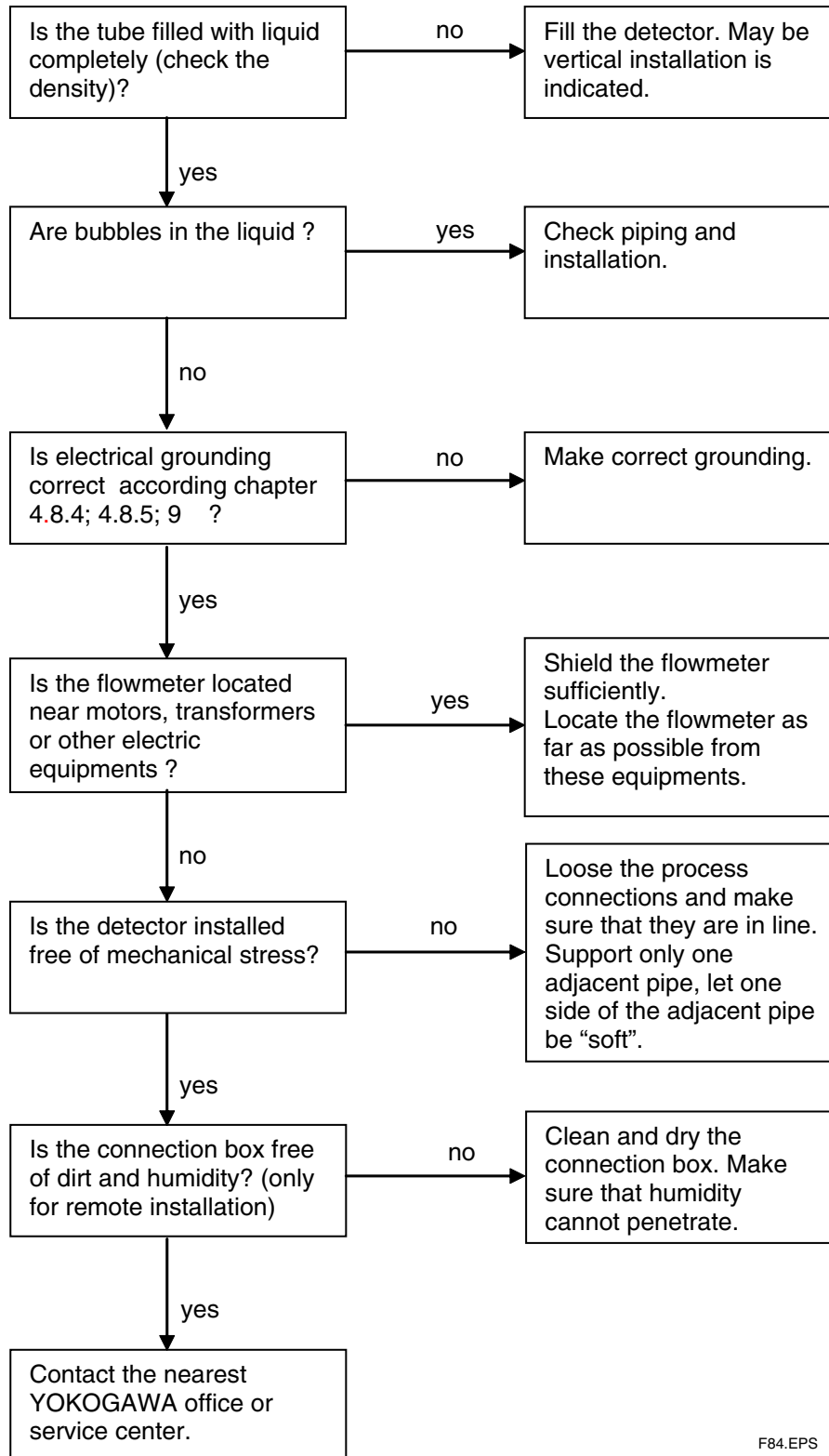
F82.EPS

8.7.3 No HART communication



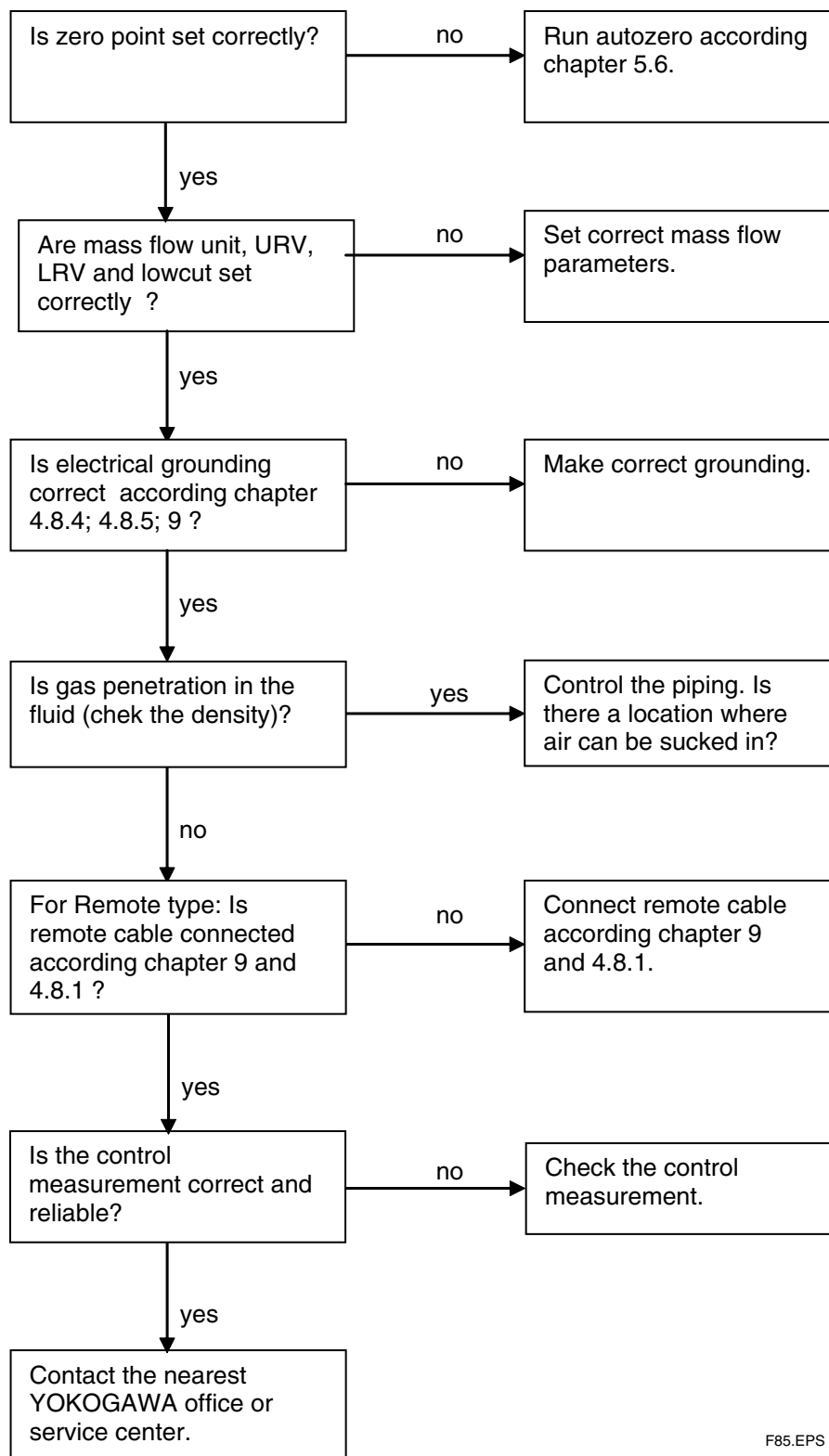
F83.EPS

8.7.4 Unstable zero



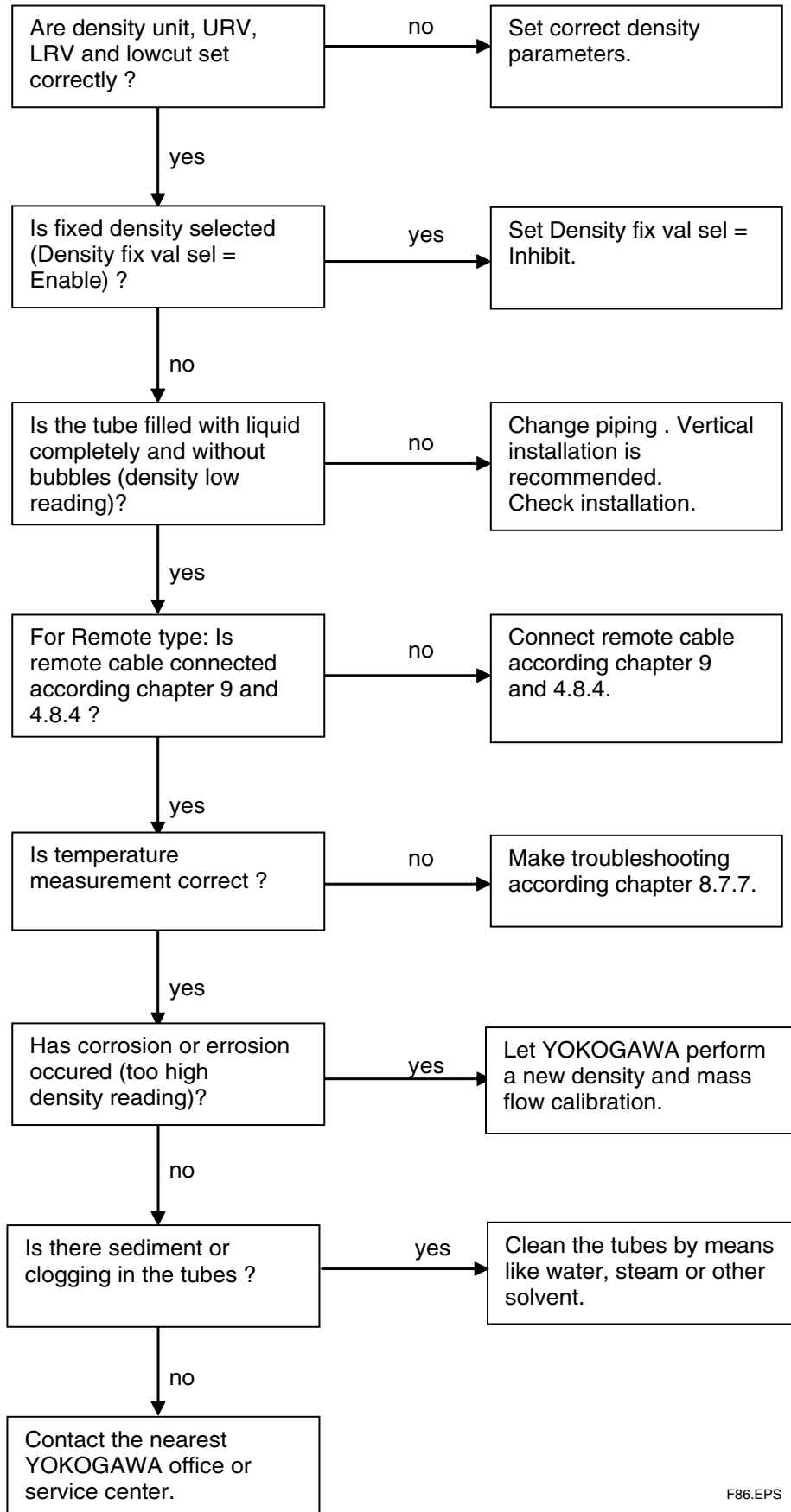
F84.EPS

8.7.5 Disagreement of indication with actual flow rate



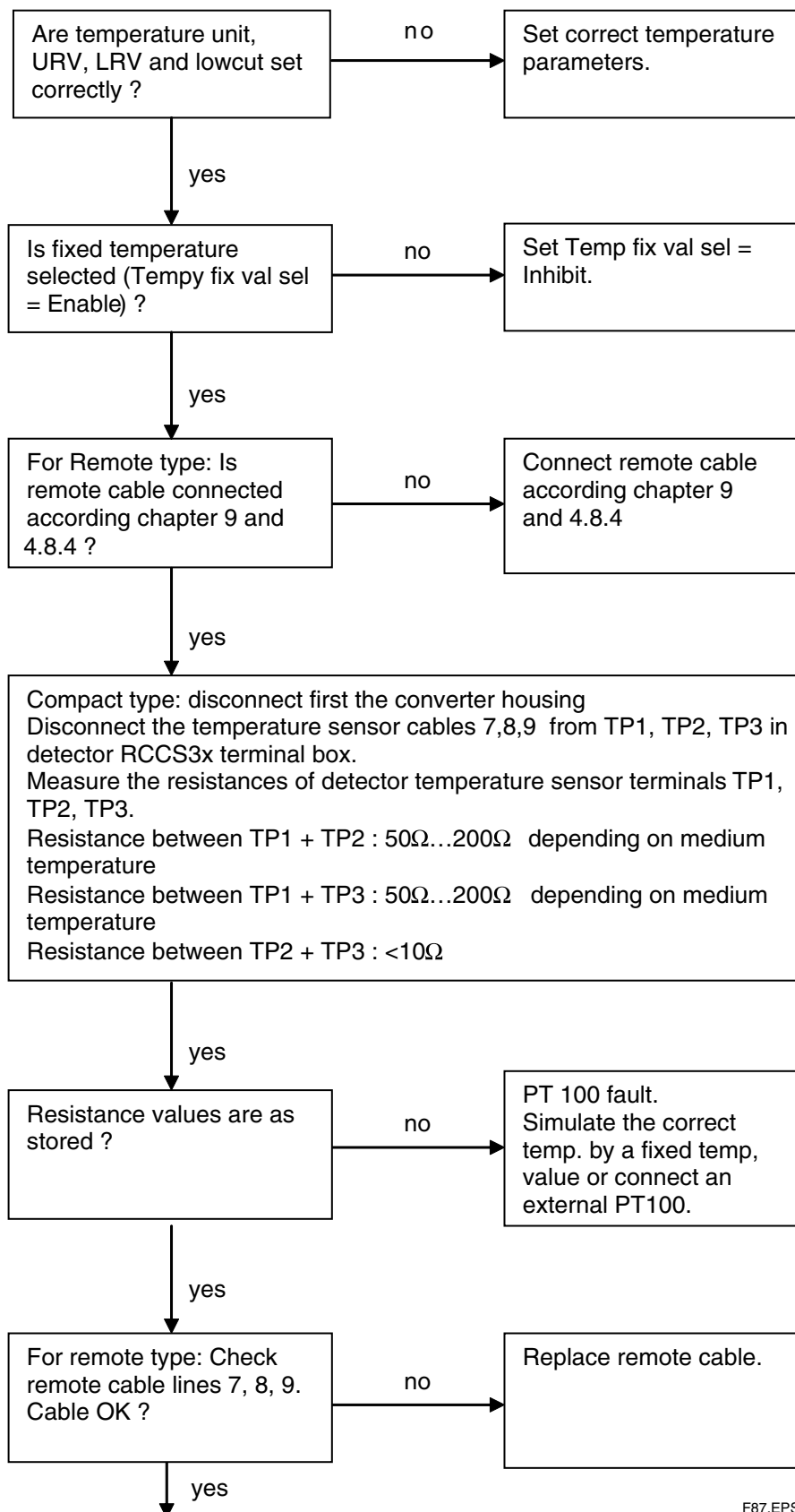
F85.EPS

8.7.6 Disagreement of indication with actual density

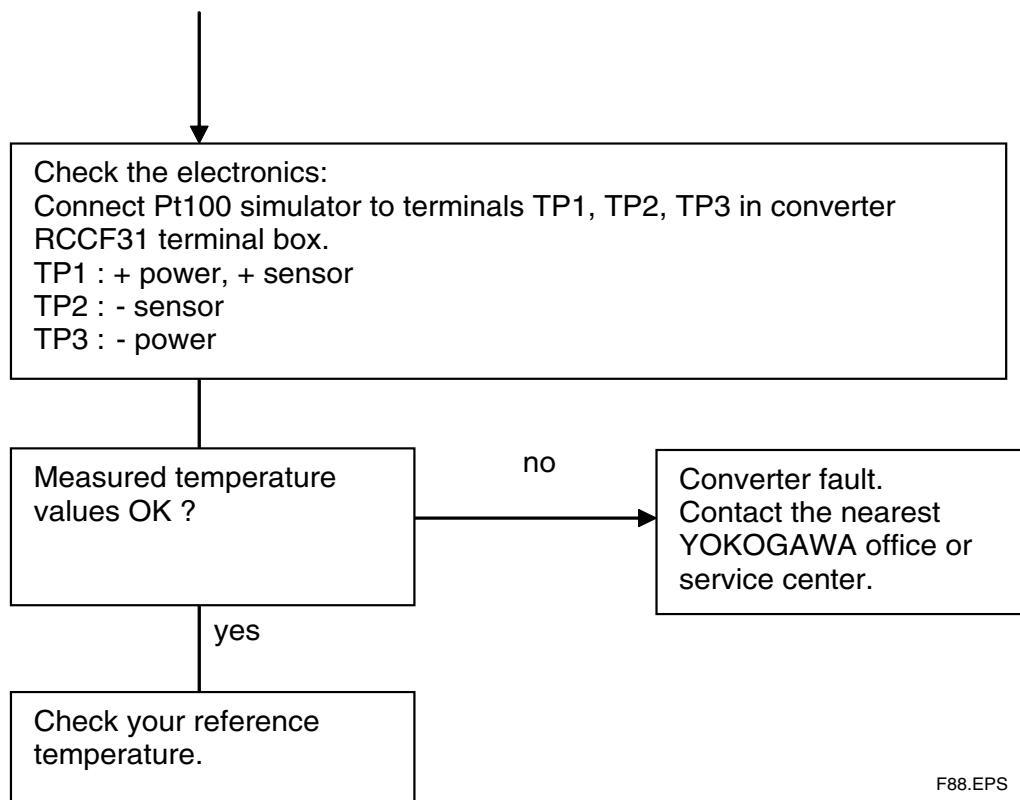


F86.EPS

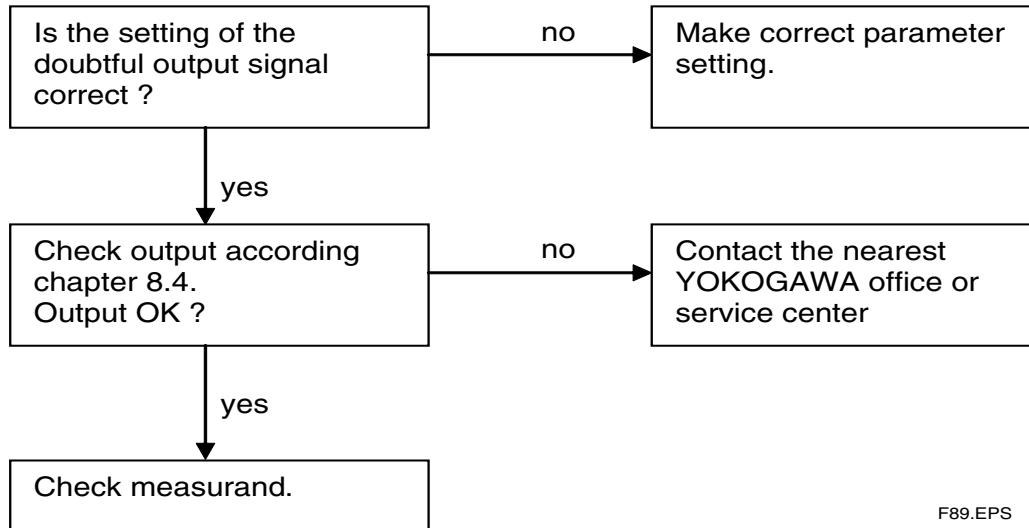
8.7.7 Disagreement of indication with actual temperature



F87.EPS



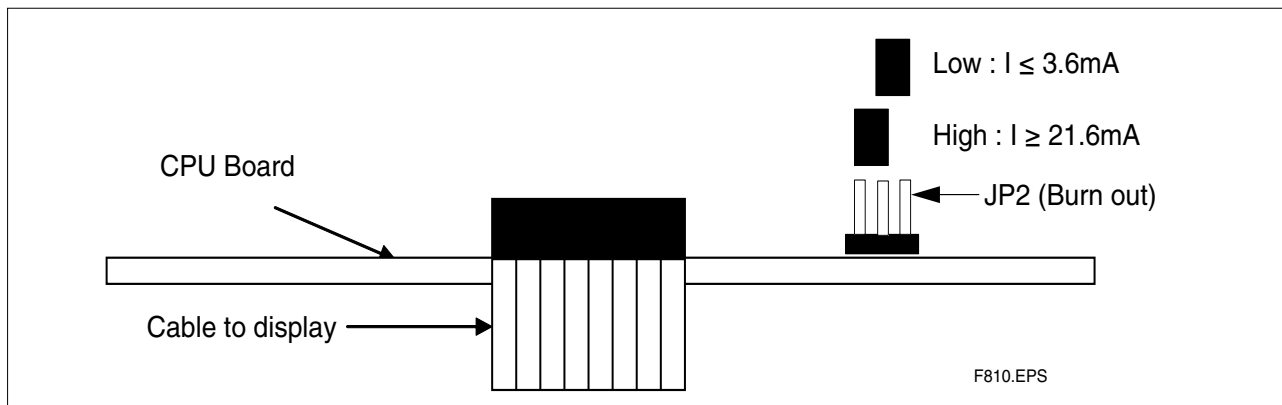
8.7.8 Discrepancy of output signals to the assigned measurand



8.7.9 Setting "Burn-out" mode

The flowmeter is equipped with a CPU error burn-out function used to set the analog output direction upon CPU error. When factory-shipment the output of CPU error burn-out is set to HIGH. The setting of the direction of analog output from burn-out can be changed.

To change the direction of output arising from burn-out, switch the jumper J2 on the CPU Board (see figure below).



8.8 Detection of metering tube failure

The ROTAMASS RCCx34 ... 39/XR was tested and FM- approved according to ANSI/ISA – 12.27.01 – 2003 for Canadian Dual Seal Approval. For units with option /DS this is stated on the name plate.



NOTE

If ROTAMASS flowmeter is not used in Canada this functionality can also be used without Dual Seal approval.

The primary seal (metering tube) and the secondary seal withstand the maximum test pressures forced for the maximum flange pressure of 12.41 MPas / 1800 psi (Flange A4, ASME 900). However the enclosure do not withstand this pressure. For details see GS 01R04B04-00E-E.

When the metering tube fails, the detector enclosure is filled with process medium and the density reading of ROTAMASS increases rapidly. This can be used for detecting a primary seal failure by the following annunciation methods:

A) Via too high density reading, preferable with liquid application

- Set "Basic setup / Density / Density URV about 0.3 kg/l above the highest possible process density.
- Set an output (current or frequency) to density transmission.
- If the URV is reached (e.g. 20 mA) the primary seal failed.
- Set **Status output** to **Density alm 1** and status output will be active in case of tube failure.

B) Via Status output and "Empty pipe detection"

Only for liquid (only possible with software version 1.7 or higher):

- Check parameter "Basic Setup / Density / Density URV" (Default value is 1.5 kg/l).
URV should be about 0.3 kg/l higher than any density the process can provide.
- Set parameter "Detailed Setup / Empty pipe detect / Empty pipe alm sel / Apply".
- Set parameter "Detailed Setup / Empty pipe detect / Empty pipe crit / ..." to a value which is a little bit higher than Density URV.
- For detection with e.g. status output 1:
Set "Detailed Setup / Config Output/Input / Pulse/Status out 1 / Pulse/Stat 1 select / Status out".
Set "Detailed Setup / Config Output/Input / Pulse/Status out 1 / SO1 function / Empty alarm"
- When the metering tube fails, the detector housing is filled with the process medium and the density increases. Alarm A15 "Empty pipe detection" appears, display is blinking and the status output is set active.

C) Via rupture disk (option /RD), preferable with gas application

- When the metering tube fails, the installed rupture disk bursts at about 20 bar (290 psi).
- For gas application the result will be a whistle by the gas blowing out.
- Rupture disk is only for annunciation.

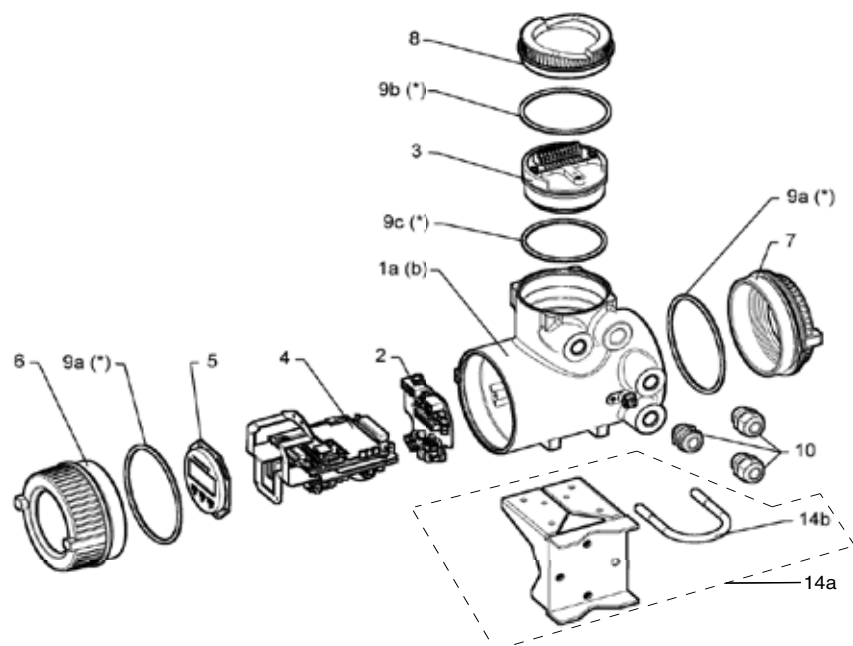


WARNING

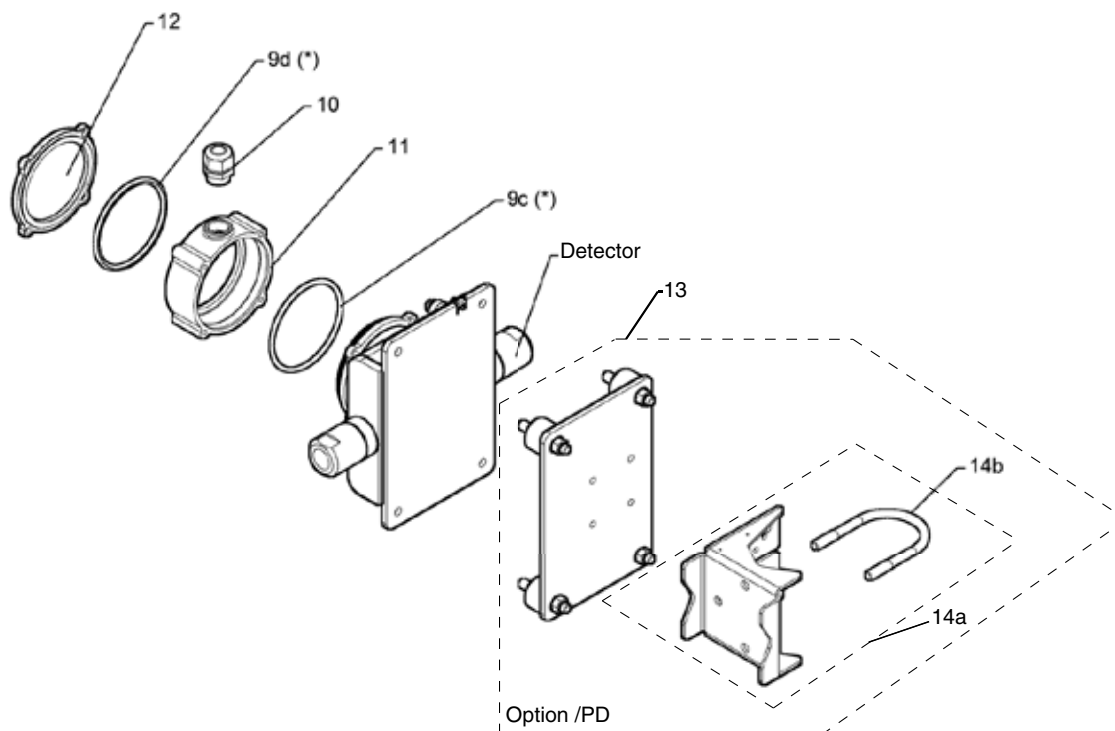
If rupture disk bursts, the hazardous process medium is pressed out of the detector housing to the environment. Take care that no worker gets contact to the medium.

8.9 Customer Maintenance Part List

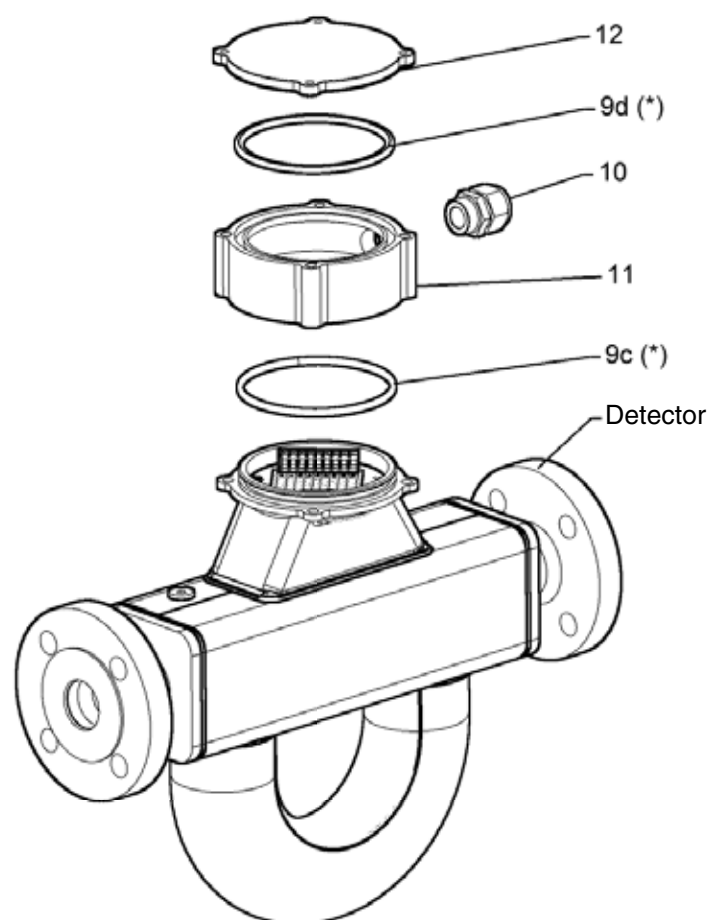
Converter RCCF31 (RCCT3)



Detector RCCS30 ... 33



Detector RCCS34 ... 39/XR



8. SELF-DIAGNOSTIC AND TROUBLESHOOTING

Item	Part-No.	Descriptions	RCCT34..39/XR	RCCF31	RCCS34..39/XR	RCCS30..33
1a	M3808PA-SP	Complete CF-M20 Converter Housing		x		
	M3808PC-SP	Complete CF-M20 Converter Housing Epoxy		x		
	M3808PE-SP	Complete CF-NPT Converter Housing		x		
	M3808PG-SP	Complete CF-NPT Converter Housing Epoxy		x		
1b	M3808NL-SP	Complete CT-M20 Converter Housing	x			
	M3808NN-SP	Complete CT-M20 Converter Housing Epoxy	x			
	M3808NQ-SP	Complete CT-NPT Converter Housing	x			
	M3808NS-SP	Complete CT-NPT Converter Housing Epoxy	x			
2	M3810DD-SP	CF/CT Base Board Set Std	x	x		
	M3810DE-SP	CF/CT Base Board Set /FB Std	x	x		
3	M3810DF-SP	CF/CT Cap Assy Std (/HP)	x	x		
4	M3810DS-SP	CF/CT Amplifier AC Std	x	x		
	M3810DT-SP	CF/CT Amplifier AC Std /NM	x	x		
	M3810DW-SP	CF/CT Amplifier AC Std /XR	x	x		
	M3810DX-SP	CF/CT Amplifier AC Std /XR /NM	x	x		
	M3810DY-SP	CF/CT Amplifier DC Std	x	x		
	M3810DZ-SP	CF/CT Amplifier DC Std /NM	x	x		
	M3810EA-SP	CF/CT Amplifier DC Std /XR	x	x		
	M3810EB-SP	CF/CT Amplifier DC Std /XR /NM	x	x		
	M3810EC-SP	CF/CT_FB Amplifier AC Std	x	x		
	M3810ED-SP	CF/CT_FB Amplifier AC Std /XR	x	x		
	M3810EE-SP	CF/CT_FB Amplifier DC Std	x	x		
	M3810EF-SP	CF/CT_FB Amplifier DC Std /XR	x	x		
5	M3808TC-SP	CF/CT Display Set	x	x		
	M3808TD-SP	CF/CT Display Set /FB	x	x		
6	M3810DJ-SP	CF/CT Cover with Window PU (not Ex)	x	x		
	M3810DK-SP	CF/CT Cover with Window Epoxy (not Ex)	x	x		
7	M3810DL-SP	CF/CT Short Cover PU	x	x		
	M3810DM-SP	CF/CT Short Cover Epoxy	x	x		
8	M3810DN-SP	CF/CT Small Cover PU		x		
	M3810DP-SP	CF/CT Small Cover Epoxy		x		
9*	M3808TB-SP	CF/CT/CS Complete O-Ring Set Conv./Sens.	x	x	x	x
9a	M3809EF-SP	10pcs O-Ring Set 109,4x3,1 NBR70 N7S33-59	x	x		
9b	M3809EG-SP	10pcs O-Ring Set 89,4x3,3 NBR70 N7S33-59		x		
9c	M3809EH-SP	10pcs O-Ring Set 84x3 NBR70 N7S33-59	x	x	x	x
9d	M3809EJ-SP	10pcs O-Ring Set 81x4 NBR70 N7S33-59			x	x
10	M3810EH-SP	Cable Gland M20x1,5 Black	x	x		
	M3810EK-SP	Cable Gland M20x1,5 Nickel-plated Brass			x	x
	M3810FB-SP	Cable Gland M20x1,5 Stainless Steel			x	x
	M3810EJ-SP	Cable Gland NPT1/2-14 Nickel-plated Brass	x	x		
	M3810FC-SP	CS Cable Gland SetNPT Nickel-plated Brass			x	x
	M3810FD-SP	CS Cable Gland-Set NPT Stainless Steel			x	x
	M3810EM-SP	Adapter NPT½-14 => G1/2	x	x		
11	M3808SZ_SP	CS Connection Housing- 316L Set			x	x
12	M3808TA-SP	CS Connection Housing Cover- 316L Set			x	x
13	M3806JA-SP	2" Pipe Mounting Set (Option /PD)				x
14a	M3810DR-SP	CF Mounting Bracket+Bracket Mounting Set		x		
14b	M3808TE-SP	CF Bracket Mounting Set		x		
	M3810EP-SP	CT Wiring Loom	x			
	M3806ZZ-SP	CF/CT Connection Part-Set	x	x		
	M3810DQ-SP	CY Cable Termination Set				

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

9.1 ATEX

In this section, further requirements and differences for explosion proof type instrument are described. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.



WARNING

Only trained persons may use the instrument in industrial location.

ROTAMASS is produced by
Rota Yokogawa
Rheinstr. 8
D-79664 Wehr
Germany

9.1.1 Technical Data

Applicable standards:

EN 60079-0: 2006; EN 60079-1: 2007;
EN 60079-7: 2007; EN 60079-11:2007;
EN 61241-0: 2006; EN 61241-1: 2004;
EN 61241-11: 2006

Remote detector RCCS30 ... 39/XR (option /KS1):

- KEMA 01ATEX 1075 X
- Intrinsically safe
- II 2G Ex ib IIB/IIC T1 ... T6
- II 2D Ex ibD 21 IP6x Txxx
(xxx = max. surface temperature see below)
- Max. surface temperature :

Standard	: 150°C
/MT	: 220°C
/HT	: 350°C
- Degree of protection : IP67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range
Standard and option /MT: -50°C to +80°C
Option /HT (process temperature < 280°C):
: -50°C to +65°C
Option /HT (process temperature < 350°C):
: -50°C to +55°C
- Process temperature limits :

Standard	: -50°C to 150°C
Option /MT:	: -50°C to 220°C
Option /HT	: 0°C to 350°C
- Heat carrier fluid temperature limits :

Standard	: -50°C to 150°C
Option /MT:	: -50°C to 220°C
Option /HT	: 0°C to 350°C

Remote converter RCCF31 (option /KF1):

- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- II 2G Ex d(e) [ib] IIC T6
- II 2G Ex d(e) [ib] IIB T6 with option /HP
- II 2D Ex tD [ibD] A21 IP6x T75°C
- Max. surface temperature: 75°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range: -40°C to +55°C

Remote converter RCCF31 (option /KF2):

- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs.
- II 2G Ex d(e) [ia] [ib] IIC T6
- II 2G Ex d(e) [ia] [ib] IIB T6 with option /HP
Protection [ia] refers to the intrinsic safe outputs.
Protection [ib] refers to the connection to the detector.
- II 2D Ex tD [ibD] A21 IP6x T75°C
- Max. surface temperature: 75°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Remote converter RCCR31 (option /KS1) :

- KEMA 02ATEX 2183 X
- Associated apparatus with intrinsic safe connection to detector (ib)
- II (2)G [Ex ib] IIC
- II (2)G [Ex ib] IIB with option /HP
- II (2)D [Ex ibD]
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity: 0 to 95% RH
- Ambient temperature range: -40°C to +55°C



WARNING

Remote rack mount converter RCCR31 must only be installed in safe area !

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

Integral type RCCT34 ... 39/XR (option /KF1):

- KEMA 02ATEX 2183 X
- Flame proof with intrinsic safe connection to detector (ib)
- II 2G Ex d(e) [ib] IIC T6 ... T3
- II 2G Ex d(e) [ib] IIB T6 ... T3 with option /HP
- II 2D Ex tD A21 IP6x T150°C
- Max. surface temperature : 150°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Integral type RCCT34 ... 39/XR (option /KF2):

- KEMA 02ATEX 2183 X
 - Flame proof with intrinsic safe connection to detector (ib)
 - Additional intrinsic safe outputs.
 - II 2G Ex d(e) [ia] [ib] IIC T6 ... T3
 - II 2G Ex d(e) [ia] [ib] IIB T6 ... T3 with option /HP
Protection [ia] refers to the intrinsic safe outputs.
Protection [ib] refers to the connection to the detector.
 - II 2D Ex tD A21 IP6x T150°C
 - Max. surface temperature : 150°C
 - Degree of protection : IP67
 - Power supply: 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
 - Power consumption : max. 25 VA / 10 W
 - Ambient humidity : 0 to 95% RH
 - Ambient temperature range : -40°C to +55°C
- The electronics of RCCT3 and RCCF31 are placed in a pressure tight section of the converter housing Ex d.
- The kind of protection of the terminal enclosure is "e", but can become "d" by using Ex-d certified cable glands.

Electrical data remote detector RCCS30 ... 33:

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$; $P_i = 0.212 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
Ex ib IIB : $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$; $P_i = 0.612 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
- Temp. sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$
 $C_i = \text{negligible small}$

Electrical data remote detector RCCS34 ... 39/XR :

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$; $P_i = 0.212 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
Ex ib IIB : $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$; $P_i = 0.612 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 2.1 \text{ mH}$; $C_i = \text{negligible small}$
- Temp. sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$
 $C_i = \text{negligible small}$

Electrical data remote converter RCCF31, RCCR31 and converter of Intergral type RCCT3:

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.171 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \mu\text{F}$
Ex ib IIB : $U_o = 11.7 \text{ V}$; $I_o = 124 \text{ mA}$; $P_o = 0.363 \text{ W}$
 $L_o = 8 \text{ mH}$; $C_o = 10.3 \mu\text{F}$
- Sensor circuits: terminals S1+/ S1- or S2+ / S2-
Ex ib IIC : $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.171 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \mu\text{F}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_o = 13.3 \text{ V}$; $I_o = 40 \text{ mA}$; $P_o = 0.133 \text{ W}$
 $L_o = 20 \text{ mH}$; $C_o = 0.91 \mu\text{F}$
- Current output (only option /KF2) :
Ex ia IIC : $U_i = 30 \text{ V}$; $I_i = 165 \text{ mA}$; $P_i = 1.25 \text{ W}$
 $L_i = \text{negligible small}$; $C_i = 6.91 \text{ nF}$
- Pulse output (only option /KF2) :
Ex ia IIC : $U_o = 30 \text{ V}$; $I_o = 100 \text{ mA}$; $P_o = 0.75 \text{ W}$
 $L_o = \text{negligible small}$; $C_o = 4.51 \text{ nF}$

**Coherence between temperature class, ambient- and medium temperature/
temperature of heat carrier :**

	RCCS30 to RCCS33 without insulation		RCCS30 to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F
T2	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F

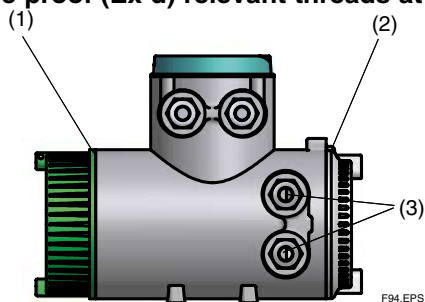
	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°F	65°C / 149°F	+55°C / 131°F	65°C / 149°C
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F	+55°C / 131°F	80°C / 176°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	+55°C / 131°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	+55°C / 131°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C / 149°F	275°C / 527°F	+55°C / 131°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	+55°C / 131°F	150°C / 302°F



NOTE

For customer insulation of RCCS30 to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

Flame proof (Ex d) relevant threads at converter housing and covers:



No.	Position of thread	Pitch	Thread form + quality of pitch	Threads engaged	Depth of engagement
(1) case	Thread on electronic/display side	2 mm	medium, 6H *)	≥ 6	12 mm
(1) cover	Thread on electronic/display side	2 mm	medium, 6g *)	≥ 6	12 mm
(2) case	Thread on terminal box side	2 mm	medium, 6H *)	≥ 6	12 mm
(2) cover	Thread on terminal box side	2 mm	medium, 6g *)	≥ 6	12 mm
(3) M	Thread for cable glands M20 x 1.5	1.5 mm	medium, 6H *)	≥ 10	17 mm
(3) A/F	Thread for cable glands 1/2 " NPT	1.814 mm	**)	6.5 ± 1	13.605 mm

*) acc. ISO 965-1 and ISO 965-3

**) acc. ANSI B 1.20.1

If terminal enclosure is used as Ex e, the threads (2) and (3) in above table must be not be regarded.

9.1.2 Installation

Integral type RCCT3



WARNING

1. Ex type of ROTAMASS must be connected to the suitable IS earthing system (see installation diagram). Converter case must have connection to the potential equalisation facility. If the connecting process tubing is part of the potential equalisation, no additional connection is required.
2. Use the certified cable glands, suitable for the conditions of use. The delivered cable glands are only for Ex e use. For Ex d use d-type cable glands.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).

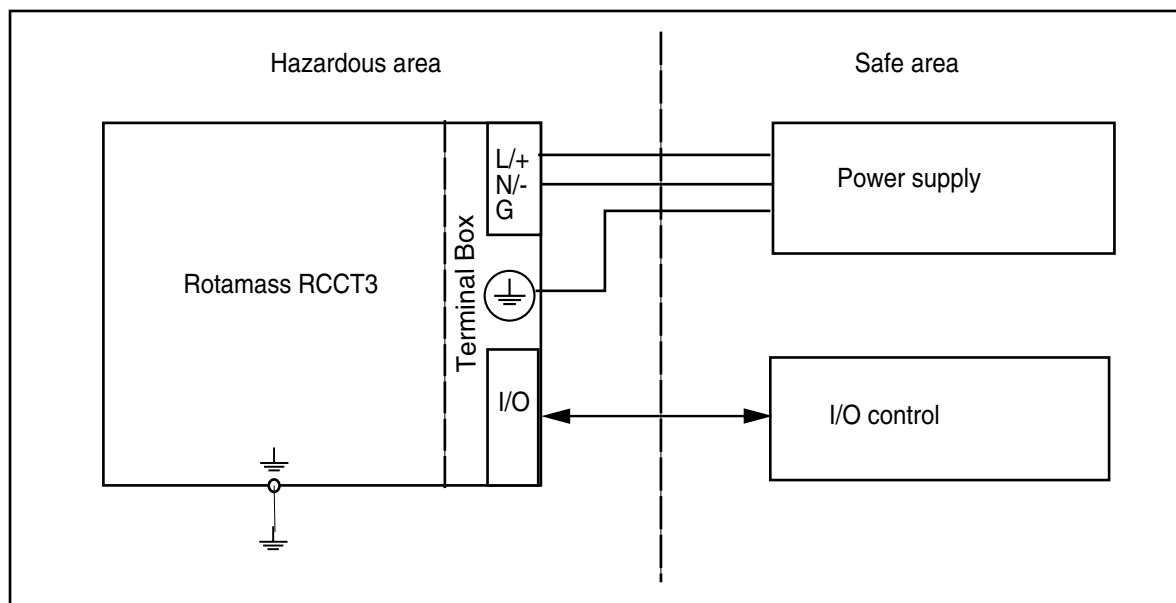
Cable glands for power- and I/O-cables :

RCCT3x-xxxM : Ex e types are enclosed. These cable glands can also be used for “dust application” (D). Use ATEX-certified Ex d cable glands for Ex d condition.

RCCT3x-xxxA : No cable glands are enclosed. Use the ATEX-certified cable glands, suitable for the conditions of use (Ex de or Ex d or dust application).

For “dust application” (D) use cable glands with minimum IP67 protection !

Installation diagram (option /KF1):



F91.EPS

Detailed information for connection intrinsic safe outputs (option /KF2) see chapter 4.8.8.

Remote field-mount type RCCF31 with RCCS3



WARNING

1. Ex-type RCCF31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
2. Use the certified cable glands, suitable for the conditions of use.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).
5. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Cable glands for power- and I/O-cables :

RCCF31-xxxM : Ex e types are enclosed. These cable glands can also be used for “dust application” (D).
Use ATEX-certified Ex d cable glands for Ex d condition.

RCCF31-xxxA : No cable glands are enclosed. Use the ATEX-certified cable glands, suitable for the conditions of use (Ex de or Ex d or dust application)

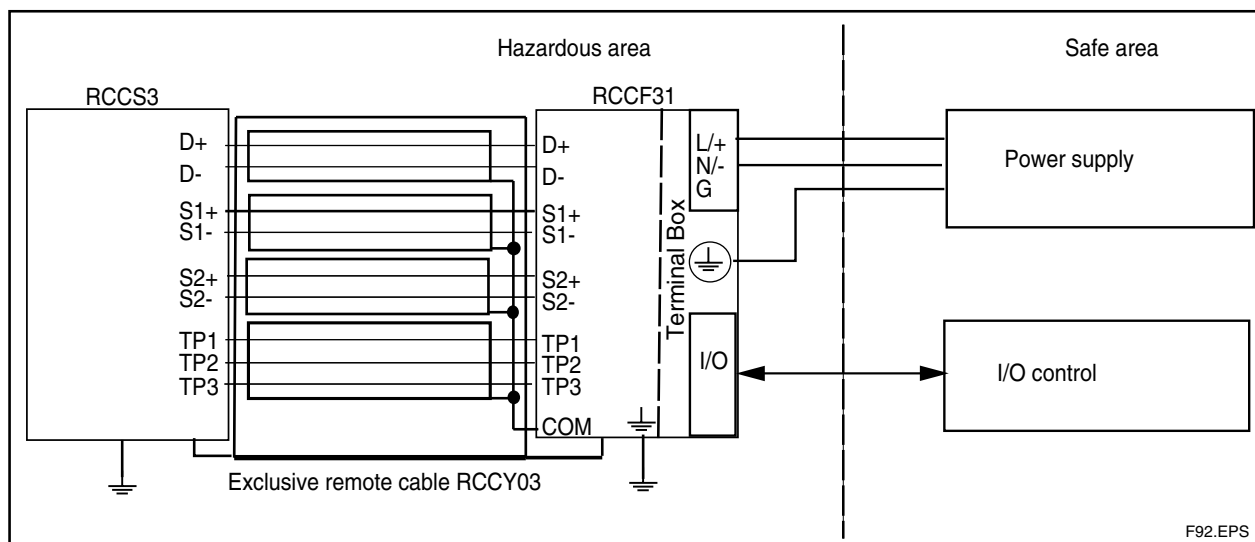
For “dust application” (D) use cable glands with minimum IP67 protection !

Cable glands for detector connection terminal :

RCCF31-xxxM : Cable glands are fitted in the concerning thread. This cable gland can be used for “dust application” (D).

RCCF31-xxxA : Cable glands are enclosed. This cable gland can also be used for “dust application” (D).

Installation diagram (option /KF1) :



The inner shields (shields of the cable pairs) are connected together to COM – terminal on converter side. The outer shield of the cable is connected on both sides to the cases by cable gland.

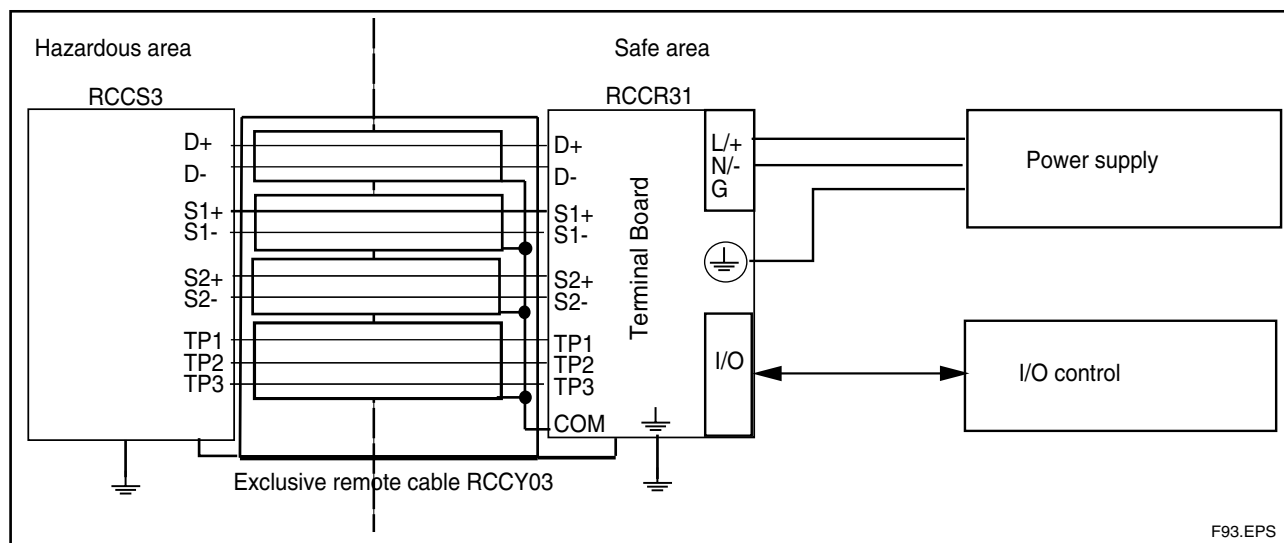
Detailed information for connection intrinsic safe outputs (option /KF2) see chapter 4.8.8

Remote rack-mount type RCCR31 with RCCS3

**WARNING**

- 1.. Remote rack-mount converter RCCR31 may only be installed in safe area !
2. Ex-type RCCR31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.1.3 Operation

If the cover of the converter RCCF31 / RCCT3 has to be opened, following instructions must be followed.



CAUTION

1. Confirm that the power cables to the instrument are disconnected.
2. Wait 15 minutes after power is turned off before opening the covers.
3. The covers of display side and terminal box are fixed with special screws, please use Hexagonal Wrench to open the covers.
4. Be sure to lock the cover with special screw driver using the Hexagonal Wrench after tightening the cover.
5. Before starting the operation again, be sure to lock the cover with the locking screws.
6. Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.1.4 Maintenance and repair



WARNING

The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.

9.1.5 Ex-relevant marking on name plates (refer to chapter 3.11)

RCCT3 option /KF1:

KEMA 02 ATEX 2183X
 II 2G Ex d [ib] IIC T6...T3 or
 II 2G Ex de [ib] IIC T6...T3
 II 2D Ex tD A21 IP6x T150°C
 DIODE SAFETY BARRIER Um : 250Vac/dc
 TEMP. CLASS T6 T5 T4 T3
 PROCESS TEMP. 65 80 115 150°C
 ENCLOSURE: IP67
 SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF1 + /HP:

KEMA 02 ATEX 2183X
 II 2G Ex d [ib] IIB T6...T3 or
 II 2G Ex de [ib] IIB T6...T3
 II 2D Ex tD A21 IP6x T150°C
 DIODE SAFETY BARRIER Um : 250Vac/dc
 TEMP. CLASS T6 T5 T4 T3
 PROCESS TEMP. 65 80 115 150°C
 ENCLOSURE: IP67
 SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF2:

KEMA 02 ATEX 2183X
 II 2G Ex d [ia][ib] IIC T6...T3
 or II 2G Ex de [ia][ib] IIC T6...T3
 II 2D Ex tD A21 IP6x T150°C
 DIODE SAFETY BARRIER Um : 250Vac/dc
 TEMP. CLASS T6 T5 T4 T3
 PROCESS TEMP. 65 80 115 150°C
 ENCLOSURE: IP67
 SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCT3 option /KF2 + /HP:

KEMA 02 ATEX 2183X
 II 2G Ex d [ia][ib] IIB T6...T3 or
 II 2G Ex de [ia][ib] IIB T6...T3
 II 2D Ex tD A21 IP6x T150°C
 DIODE SAFETY BARRIER Um : 250Vac/dc
 TEMP. CLASS T6 T5 T4 T3
 PROCESS TEMP. 65 80 115 150°C
 ENCLOSURE: IP67
 SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

RCCF31 option /KF1:

KEMA 02 ATEX 2183X
II 2G Ex d [ib] IIC T6 or
II 2G Ex de [ib] IIC T6
II 2D Ex tD [ibD] A21 IP6x T75°C
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF1 + /HP:

KEMA 02 ATEX 2183X
II 2G Ex d [ib] IIB T6 or
II 2G Ex de [ib] IIB T6
II 2D Ex tD [ibD] A21 IP6x T75°C
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF2:

KEMA 02 ATEX 2183X
II 2G Ex d [ia][ib] IIC T6
or II 2G Ex de [ia][ib] IIC T6
II 2D Ex tD [ibD] A21 IP6x T75°C
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCF31 option /KF2 + /HP:

KEMA 02 ATEX 2183X
II 2G Ex d [ia][ib] IIB T6 or
II 2G Ex de [ia][ib] IIB
II 2D Ex tD [ibD] A21 IP6x T75°C
DIODE SAFETY BARRIER Um : 250Vac/dc
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA



WARNING

WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

RCCR31 option /KS1:

KEMA 02 ATEX 2183X
II (2)G [Ex ib] IIC
II (2)D [Ex ibD]
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCR31 option /KS1 + /HP:

KEMA 02 ATEX 2183X
II (2)G [Ex ib] IIB
II (2)D [Ex ibD]
DIODE SAFETY BARRIER Um : 250Vac/dc
SEE CERTIFICATE FOR DATA

RCCS30 to 39/XR option /KS1:

KEMA 01 ATEX 1075X
II 2G Ex ib IIC/IIB T1...T6
II 2D Ex ibD A21 IP6x T150°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /KS1 + /MT:

KEMA 01 ATEX 1075X
II 2G Ex ib IIC/IIB T1...T6
II 2D Ex ibD A21 IP6x T220°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA

RCCS34 to 39/XR option /KS1 + /HT:

KEMA 01 ATEX 1075X
II 2G Ex ib IIC/IIB T1...T6
II 2D Ex ibD A21 IP6x T350°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA

9.2 FM (USA + Canada)

Applicable standards:

FM3600, FM3610, FM3615, FM3810,
ANSI/NEMA 250, IEC 60529,
ANSI/ISA 12.00.01, ANSI/ISA 12.22.01,
CSA-C22.2 No.157, CSA-C22.2 No.25,
CSA-C22.2 No.30, CSA-C22.2 No.0.5,
CSA-C22.2 No.142, CSA-C22.2 No.0.4,
CSA-C22.2 No.94

9.2.1 Technical Data

Remote detector RCCS30 ... 39/XR (option /FS1):

- Intrinsically safe
- AEx ia IIC, Class 1, Zone 0
- IS Class I, Division 1, Groups A,B,C,D T6
- DIP Class II / III, Division 1, Groups E,F,G
- IP67 / NEMA 4X

Remote converter RCCF31 (option /FF1):

- Housing explosion proof
- Provides intrinsically safe detector circuits
- AEx [ia] IIC, Class I, Zone 1, T6
- Class I, Division 1, Groups A,B,C,D
- Class I, Division 1, Groups C,D with option /HP
- Class II / III, Division 1, Groups E,F,G
- AIS Class I / II / III, Division 1, Groups A,B,C,D, E,F,G
- AIS Class I / II / III, Division 1, Groups C,D,E,F,G with /HP

Remote converter RCCR31 (option /FS1):

- Intrinsic safe associated apparatus
- Provides intrinsically safe detector circuits
- [AEx ia] IIC, Class I, Zone 1
- AIS Class I, Division 1, Groups A,B,C,D
- AIS Class I, Division 1, Groups C,D with option /HP

Integral type RCCT34 .. 39/XR (option /FF1):

- Housing explosion proof
- AEx d [ia] IIC, Class I, Zone 1, T6
- Class I, Division 1, Groups A,B,C,D
- Class I, Division 1, Groups C,D with option /HP
- Class II / III, Division 1, Groups E,F,G
- IP67 / NEMA 4X

Temperature classification :

The remote converter RCCF31 has a T6 temperature class rating for operation at ambient temperature up to +50°C / +122°F.

Process temperature limits / Heat carrier fluid temperature limits :

- Standard : -50°C to 150°C / -58°F to 302°F
- with option /MT: -50°C to 220°C / -58°F to 428°F
- with option /HT: 0°C to 350°C / -32°F to 662°F

Electrical data remote converter RCCF31, RCCR31 and converter of integral type RCCT3 :

- Driving circuit : terminals D+ / D-
 $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.171 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \text{ }\mu\text{F}$
- Driving circuit : terminals D+ / D- with option /HP
 $U_o = 11.7 \text{ V}$; $I_o = 124 \text{ mA}$; $P_o = 0.363 \text{ W}$
 $L_o = 8 \text{ mH}$; $C_o = 10.3 \text{ }\mu\text{F}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
 $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$; $P_o = 0.363 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \text{ }\mu\text{F}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
 $U_o = 13.3 \text{ V}$; $I_o = 40 \text{ mA}$; $P_o = 0.133 \text{ W}$
 $L_o = 20 \text{ mH}$; $C_o = 0.91 \text{ }\mu\text{F}$

Electrical data remote detector RCCS30 ... 33:

- Driving circuit : terminals D+ and D
 $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$; $P_i = 0.212 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negligible small}$
- Driving circuit : terminals D+ / D- with option /HP
 $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$; $P_i = 0.612 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negligible small}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
 $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negligible small}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
 $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$; $C_i = \text{negligible small}$

Electrical data remote detector RCCS34 ... 39/XR :

- Driving circuit : terminals D+ and D
 $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$; $P_i = 0.212 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
- Driving circuit : terminals D+ / D- with option /HP
 $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$; $P_i = 0.612 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
 $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 2.1 \text{ mH}$; $C_i = \text{negligible small}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
 $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$; $C_i = \text{negligible small}$

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

	RCCS30 to RCCS33 without insulation		RCCS30 to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F
T2	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F

	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F	50°C / 122°F	65°C / 149°C
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F	50°C / 122°F	80°C / 176°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	50°C / 122°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	50°C / 122°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C / 149°F	275°C / 527°F	50°C / 122°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	50°C / 122°F	150°C / 302°F

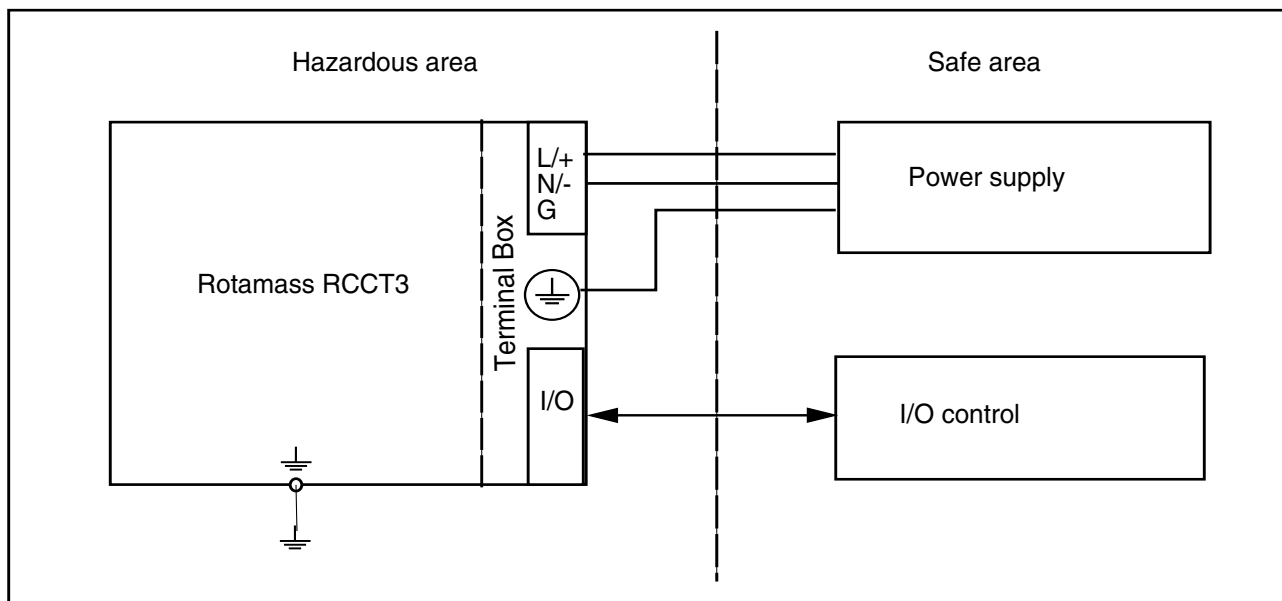


NOTE

For customer insulation of RCCS30 to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

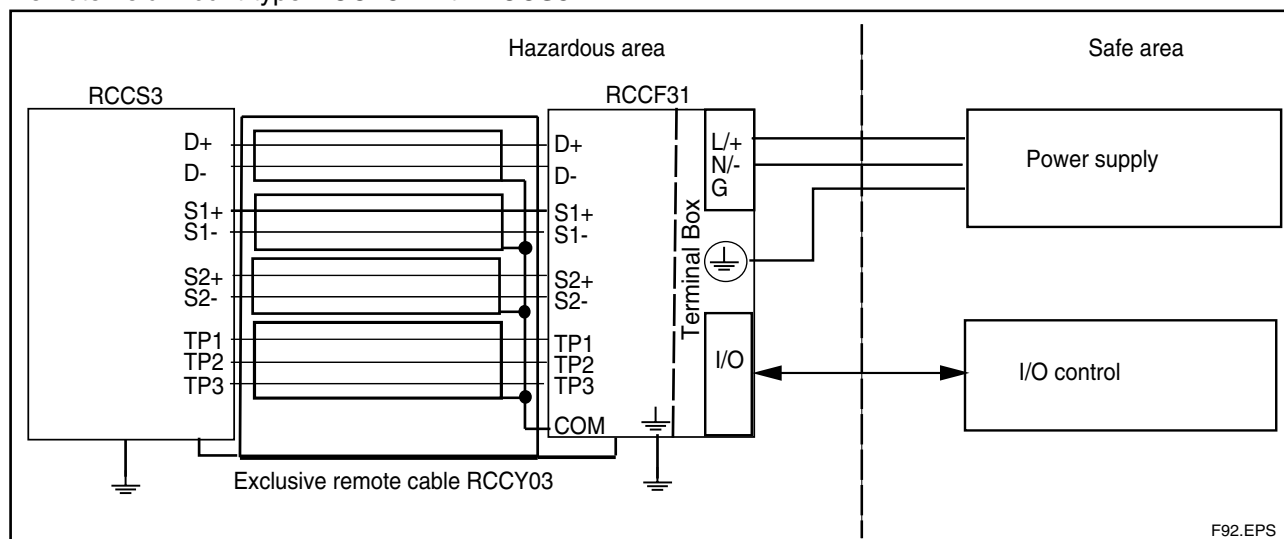
9.2.2 Installation

Integral type RCCT3 :



F91.EPS

Remote field-mount type RCCF31 with RCCS3 :



CAUTION

- The flowmeter must be connected to the potential equalization system. For remote type converter and detector case must have connection to the potential equalisation facility.
- For remote type at ambient temperature up to 60°C / 140°F use remote cable RCCY031 or RCCY032.
- For remote type at ambient temperature up to 80°C / 176°F use remote cable RCCY033.
- Maximum length of remote cable is 50 m/164 ft.
- Specified maximum ambient temperature of cables (power supply-, I/O- and remote cable) must be 20°C / 41°F above maximum ambient temperature of flowmeter.
- For AC-version maximum power supply is 250 V AC.
- Install according National Electrical Code. Intrinsically safe circuits must be installed according NEC ANSI / NPFA 70 and ISA RP 12.6.
- Use certified XP (explosion proof) cable glands for power supply and I/O.
- Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
- For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation of separate intrinsic safe ground for remote type RCCS3 with RCCF31 (see Control Drawing 8300027) :

- Remove the stopping plug on detector connecting side and replace it by a dust proofed cable gland.
- Open the cover on detector connecting side of RCCF31.
- Remove the cable between COM- terminal and the ground screw.
- Put the intrinsic safe ground cable through the new installed cable gland.
- Connect the IS-ground cable to the COM- terminal.
- Install the remote cable between detector RCCS3 and converter RCCF31 as shown in this chapter.

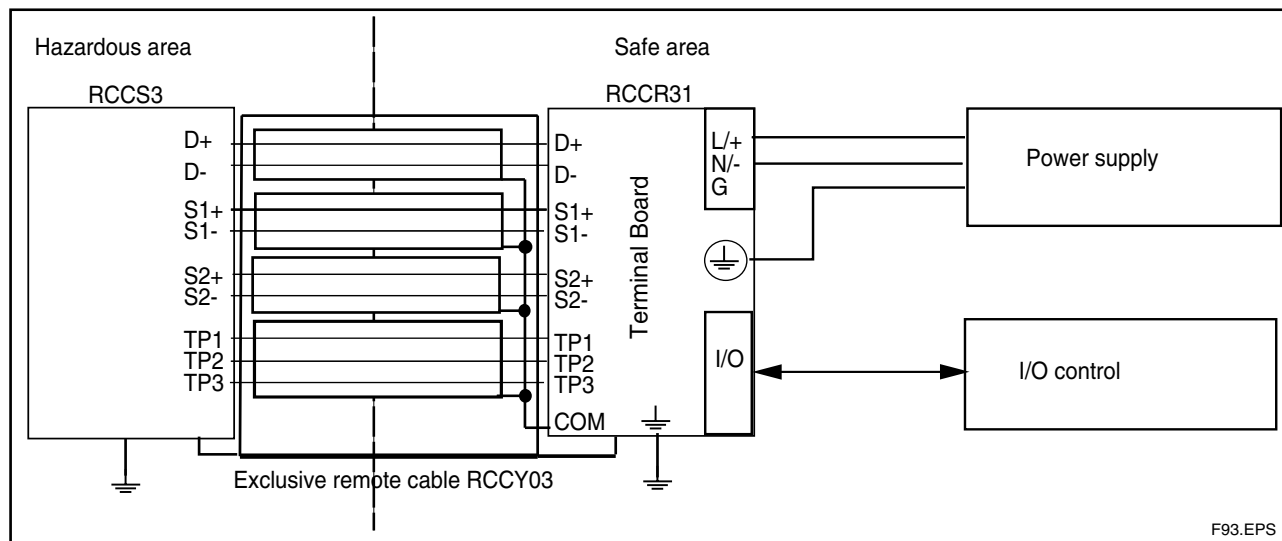
Remote rack-mount type RCCR31 with RCCS3



WARNING

1. Remote rack-mount converter RCCR31 must only be installed in safe area !
2. Ex-type RCCR31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.2.3 General warnings



WARNING

- Substitution of components may impair intrinsic safety !
- Only trained persons may use the instrument in industrial location.
- The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.
- If the cover of the converter case has to be opened, following instructions must be followed:
 - Confirm that the power cables to the instrument are disconnected.
 - Wait 15 minutes after power is turned off before opening the covers.
 - The covers of display side and terminal box are fixed with special screws, please use Hexagonal Wrench to open the covers.
 - Be sure to lock the cover with special screw using the Hexagonal Wrench after tightening the cover (see drawing chapter 4.3).
 - Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.2.4 Ex-relevant marking on name plates (refer to chapter 3.11)**RCCT3 option /FF1:**

Control Drawing No. 8300026
 Class I, Division 1; Group A, B, C, D
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIC, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCF31 option /FF1:

Control Drawing No. 8300027
 Class I, Division 1; Group A, B, C, D
 AIS Class I / II / III, Division 1, Group A, B, C, D, E, F, G
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIC, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCR31 option /FS1:

Control Drawing No. 8300028
 AIS Class I, Division 1, Group A, B, C, D
 AEx [ia] IIC, Class I, Zone 1

RCCT3 option /FF1 + /DS:

Control Drawing No. 8300026
 Class I, Division 1; Group A, B, C, D
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIC, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.
 Dual Seal

RCCS3 option /FS1:

Control Drawing No. 8300027
 IS Class I, Division 1; Group A, B, C, D, T6
 Class II / III, Division 1, Group E, F, G
 AEx ia IIC, Class I, Zone 0
 Use Conductors rated 20°C above max. ambient
 temperature
 TYPE NEMA 4X, IP67
 Temperature Class see Control Drawing

RCCT3 option /FF1 + /HP:

Control Drawing No. 8300026
 Class I, Division 1; Group C, D
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIB, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCF31 option /FF1 + /HP:

Control Drawing No. 8300027
 Class I, Division 1; Group C, D
 AIS Class I / II / III, Division 1, Group C, D, E, F, G
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIB, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.

RCCR31 option /FS1 + /HP:

Control Drawing No. 8300028
 AIS Class I, Division 1, Group C, D
 AEx [ia] IIB, Class I, Zone 1

RCCT3 option /FF1 + /HP + /DS:

Control Drawing No. 8300026
 Class I, Division 1; Group C, D
 Class II / III, Division 1, Group E, F, G
 AEx d [ia] IIB, Class I, Zone 1, T6
 Conduit Seals required within 18 inches.
 Use Conductors rated 70°C
 TYPE NEMA 4X, IP67

**WARNING**

WAIT 15 MIN. AFTER POWER-DISCONNECTION
 BEFORE OPENING THE ENCLOSURE.
 Dual Seal

RCCS3 option /FS1 + /DS:

Control Drawing No. 8300027
 IS Class I, Division 1; Group A, B, C, D, T6
 Class II / III, Division 1, Group E, F, G
 AEx ia IIC, Class I, Zone 0
 Use Conductors rated 20°C above max. ambient
 temperature
 TYPE NEMA 4X, IP67
 Temperature Class see Control Drawing
 Dual Seal

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

9.2.5 Control drawings

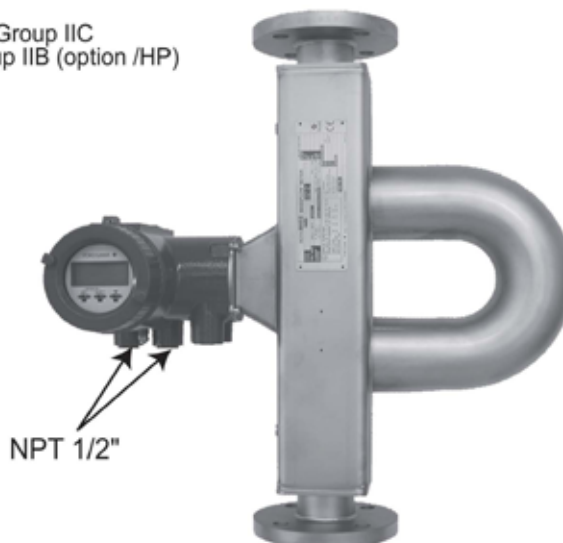
Hazardous Locations :

Class I Division 1 Groups A,B,C,D or Class I Zone 1 Group IIC
Class I Division 1 Groups C,D or Class I Zone 1 Group IIB (option /HP)
and Class II and III Division 1 Groups E,F,G

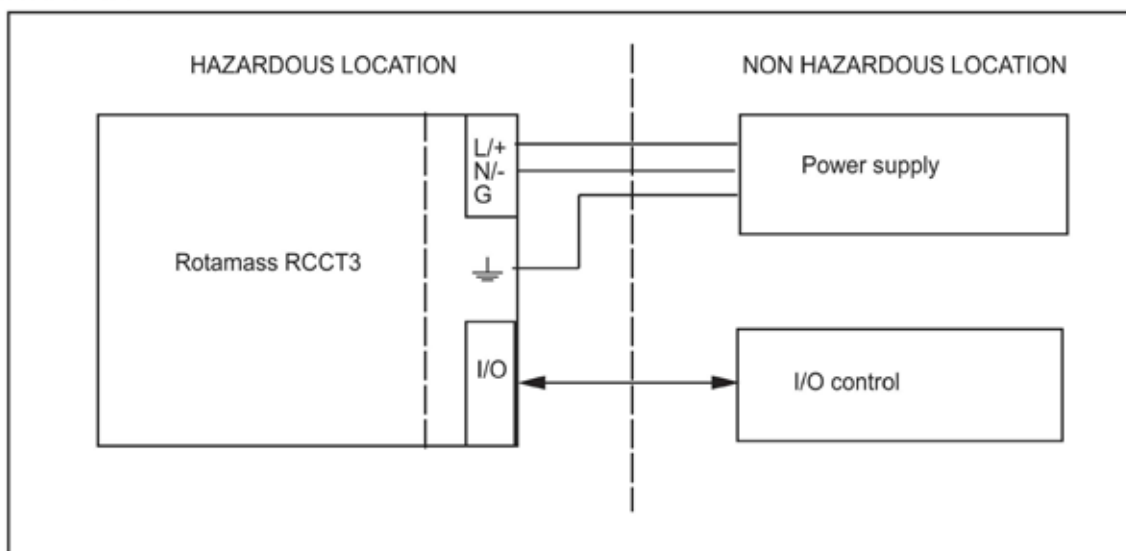
Temperature classification :

Temp. class	RCCT34 to RCCT39/XR	
	Max. Ambient temperature	Max. Medium temperature or temperature of heat carrier
T6	$\leq 50^{\circ}\text{C} / 122^{\circ}\text{F}$	$\leq 65^{\circ}\text{C} / 149^{\circ}\text{F}$
T5	$\leq 50^{\circ}\text{C} / 122^{\circ}\text{F}$	$\leq 80^{\circ}\text{C} / 176^{\circ}\text{F}$
T4	$\leq 50^{\circ}\text{C} / 122^{\circ}\text{F}$	$\leq 115^{\circ}\text{C} / 239^{\circ}\text{F}$
T3	$\leq 50^{\circ}\text{C} / 122^{\circ}\text{F}$	$\leq 150^{\circ}\text{C} / 302^{\circ}\text{F}$

The minimum ambient temperature is $-40^{\circ}\text{C} / -40^{\circ}\text{F}$



Installation :



Note :

- For AC-version maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- The installation must be in accordance with the national electrical code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada.

WARNING : Substitution of components may impair intrinsic safety.

					DATE	NAME	TITEL: FM/CSA CONTROL DRAWING ROTAMASS RCCT3
					DRAWED	09.02.2005 Butz	
					CHECKED	09.02.2005 Rü	
c	-----	5.3.07	Butz	Rü	 YOKOGAWA 79664 WEHR GERMANY	DWG. No.: 8300026	1/1
b	-----	1.9.05	Butz	Rü			
a	-----						
Rev.	UPDATE No.	DATE	EDITOR	CHECKED			

Hazardous Locations:

Remote Detector RCCS3:

Class I Division 1 Groups A,B,C,D

Class II and III Division 1 Groups E,F,G

Remote Converter RCCF31:

Class I Division 1 Groups A,B,C,D or Class 1 Zone 1 Group IIC

Class I Division 1 Groups C,D or Class 1 Zone 1 Group IIB (option /HP)

Class II and III Division 1 Groups E,F,G

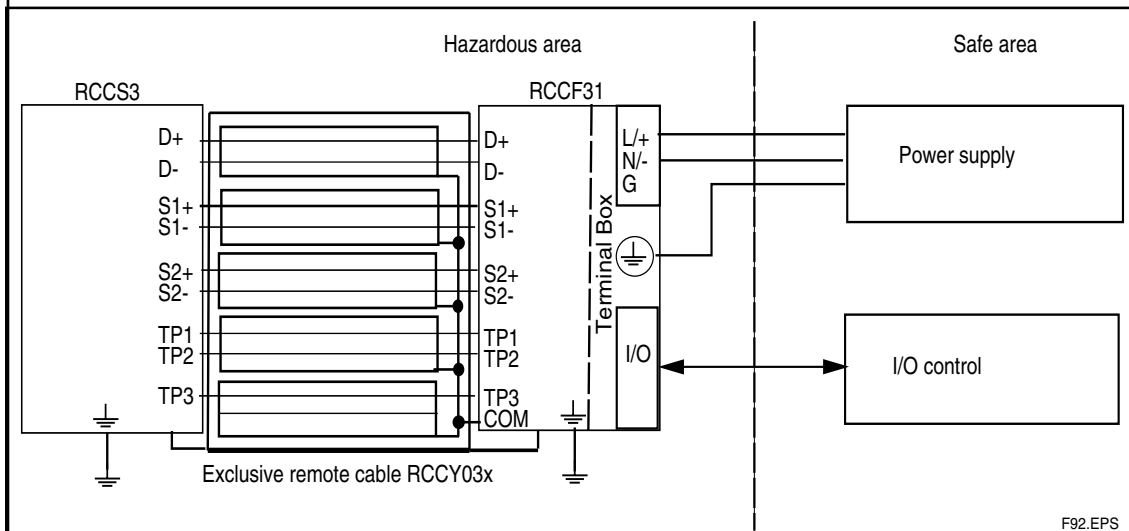
Temperature Classification:

	RCCS30 to RCCS33		RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation /T1 ...T3	
Temp. class	Max. ambient temperature	Max. process tem- perature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	40°C / 104°F	40°C / 104°F	65°C / 149°F	65°C / 149°F
T5	50°C / 122°F	80°C / 176°F	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F
T3	80°C / 176°F	150°C / 302°F	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F
T2	80°C / 176°F	150°C / 302°F	80°C / 176°F	220°C / 428°F	65°C / 149°F	275°C / 527°F
T1					45°C / 113°F	350°C / 662°F

The maximum ambient temperature for remote converter RCCF31 is 50°C / 122°F.

The minimum ambient temperature for remote converter RCCF31 is -40°C / -40°F.

The minimum ambient temperature for remote detector RCCS3 is -50°C / -58°F.

Installation :

For installation of separate intrinsic safe ground see page 2.

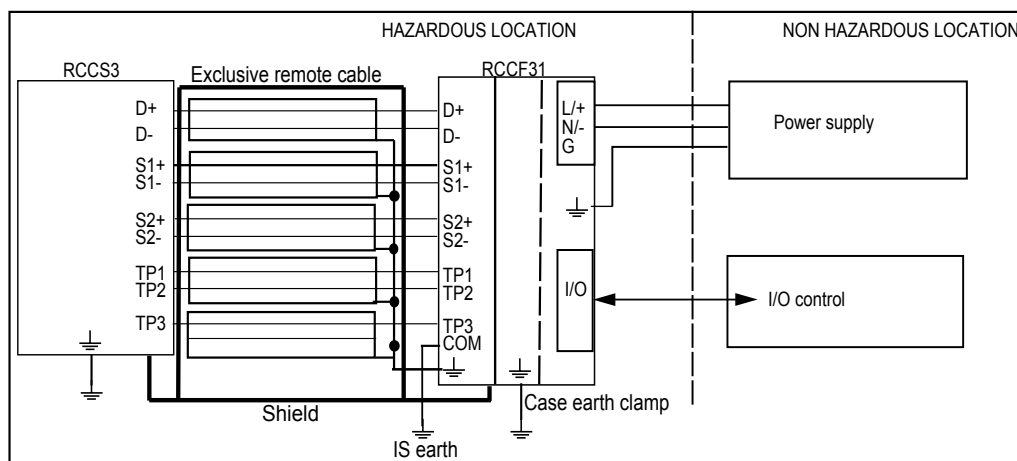
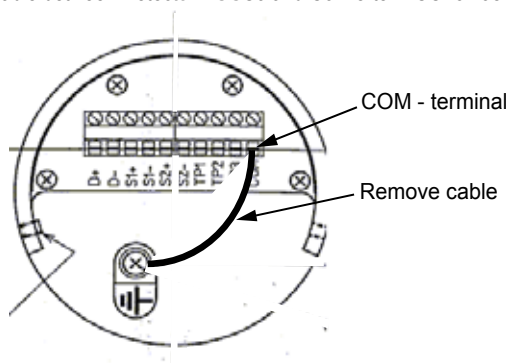
**WARNING: Substitution
of components may
impair intrinsic safety**

		Date	Name	Title: FM (US,C) CONTROL DRAWING ROTAMASS REMOTE TYPE RCCF31 + RCCS3				
Drawn		09.02.05	Butz					
Checked		09.02.05	Rü					
		ROTA YOKOGAWA 79664 Wehr Germany		Drawing: 8300027				
c	-----					5.3.07	Butz	Rü
b	-----					1.9.05	Butz	Rü
a	-----					-----	-----	-----
Rev.	Update	Date	Editor	Check	1/2			

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

Installation of intrinsic safe ground :

- Remove the stopping plug on detector connecting side of RCCF31 and replace it by a dust proofed cable gland.
- Open the cover on detector connecting side of RCCF31.
- Remove the cable between COM - terminal and the ground screw (see below picture).
- Put the intrinsic-safe-ground-cable through the new installed cable gland.
- Connect the IS-ground cable to the COM - terminal.
- Install the remote cable between Detector RCCS3 and Converter RCCF31 as shown below.



Note :

- For AC-version of RCCF31 maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- Install in accordance with NFPA 70
- Max. cable length of remote cable 50m / 164ft.
- Connect inner shields of remote cable together to COM-terminal on converter side.
- Connect outer shield of remote cable on both sides to case by cable gland.
- The installation must be in accordance with the national electrical code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada

WARNING: Substitution of components may impair intrinsic safety

							Date		Name		Title: FM (US,C) CONTROL DRAWING ROTAMASS REMOTE TYPE RCCF31 + RCCS3	
					Drawed		09.02.05		Butz			
					Checked		09.02-05		Rü			
					 YOKOGAWA 79664 Wehr Germany							
c	-----	5.3.07	Butz	Rü								
b	-----	1.9.05	Butz	Rü								
a	-----	-----	-----	-----								
Rev.	Update	Date	Editor	Check								
							Drawing:		8300027		2/2	

Hazardous Locations:

Remote Detector RCCS3:

Class I Division 1 Groups A,B,C,D

Class II and III Division 1 Groups E,F,G

Remote Converter RCCR31:

AIS / I / 1 / ABCD (option /HP only CD)

Intrinsic safe associated apparatus, must be installed in safe area!

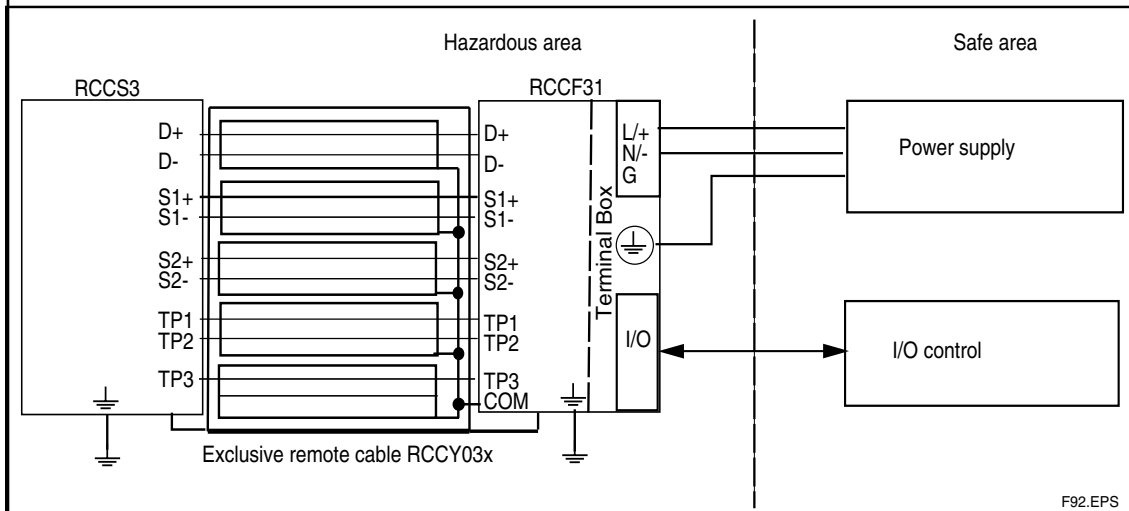
Temperature Classification:

	RCCS30 to RCCS33		RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation /T1 ... /T3	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	40°C / 104°F	40°C / 104°F	65°C / 149°F	65°C / 149°F
T5	50°C / 122°F	80°C / 176°F	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F
T3	80°C / 176°F	150°C / 302°F	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F
T2	80°C / 176°F	150°C / 302°F	80°C / 176°F	220°C / 428°F	65°C / 149°F	275°C / 527°F
T1					45°C / 113°F	350°C / 662°F

The maximum ambient temperature for remote converter RCCR31 is 50°C / 122°F.

The minimum ambient temperature for remote converter RCCR31 is -40°C / -40°F.

The minimum ambient temperature for remote detector RCCS3 is -50°C / -58°F.

Installation :

For installation of separate intrinsic safe ground see page 2.

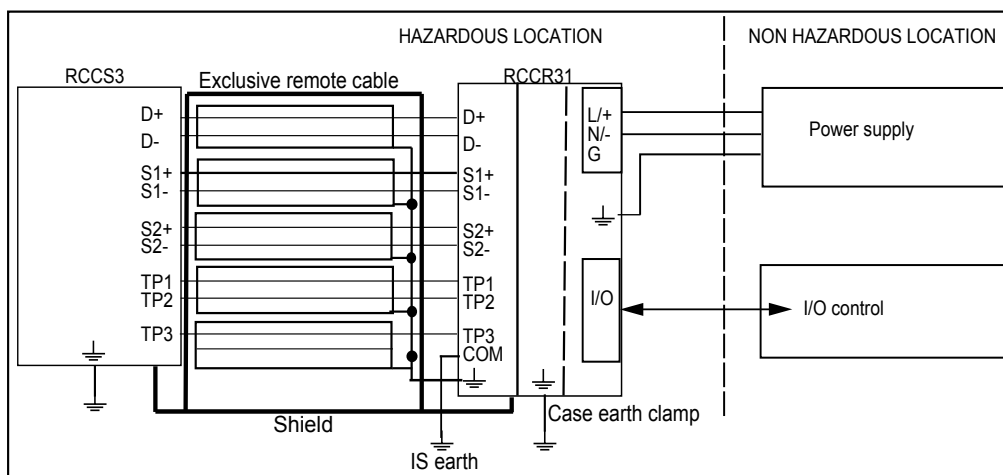
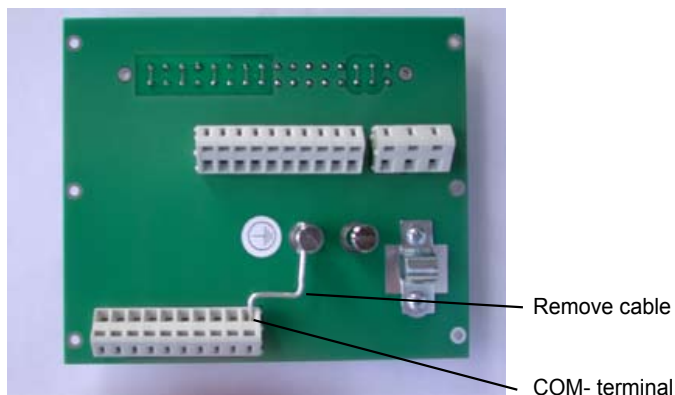
**WARNING: Substitution
of components may
impair intrinsic safety**

		Date	Name	Title: FM (US,C) CONTROL DRAWING ROTAMASS REMOTE TYPE RCCR31 + RCCS3				
		Drawn	05.03.07 Butz					
		Checked	05.03.07 Rü					
		 YOKOGAWA 79664 Wehr Germany			Drawing: 8300028			
b	-----					7.1.08	Butz	Rü
a	-----					-----	-----	-----
Rev.	Update					Date	Editor	Check
1/2								

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

Installation of intrinsic safe ground :

- Remove the cable between COM - terminal and the ground terminal (see below picture).
- Connect the IS-ground cable to the COM - terminal.
- Install the remote cable between Detector RCCS3 and Converter RCCR31 as shown below.



Note :

- For AC-version of RCCR31 maximum power supply is 250V AC.
- For DC-version maximum power supply is 28.8V DC.
- Install in accordance with NFPA 70
- Max. cable length of remote cable 50m / 164ft.
- Connect inner shields of remote cable together to COM-terminal on converter side.
- Connect outer shield of remote cable on both sides to case by cable gland (RCCS3) and clamp on terminal board (RCCR31).
- The installation must be in accordance with the national electrical code, NFPA70, article 504 to 510 and ANSI/ISA RP 12.06.01.
- The non intrinsically safe terminals must not be connected to any device that uses or generates more than 250Vrms or dc unless it has been determined that the voltage was adequately isolated.
- Installation must be in accordance with the Canadian Electrical Code, when installed in Canada

WARNING: Substitution of components may impair intrinsic safety

					Date	Name	Title: FM (US,C) CONTROL DRAWING ROTAMASS REMOTE TYPE RCCR31 + RCCS3			
					Drawn	5.3.07		Butz		
					Checked	5.3.07		Rü		
 YOKOGAWA 79664 Wehr Germany					Drawing: 8300028			2/2		
a	-----	-----	-----	-----						
Rev.	Update	Date	Editor	Check						

9.3 IECEX



WARNING

Only trained persons use this instrument in industrial locations.

9.3.1 Technical Data

Applicable Standard:

IEC 60079-0: 2004, IEC 60079-1: 2007,
IEC 60079-7: 2006, IEC 60079-11: 2006,
IEC 61241-0: 2004, IEC 61241-1: 2004,
IEC 61241-11: 2005

Certificate: IECEX KEM 06.0031X

Remote detector RCCS30 ... 39/XR (option /ES1):

- Intrinsically safe
- II 2G Ex ib IIB/IIC T1 ... T6
- II 2D Ex ibD 21 IP6x Txxx (xxx = max. surface temperature see below)
- Max. surface temperature :

Standard	: 150°C
/MT	: 220°C
/HT	: 350°C
- Degree of protection : IP67
- Ambient humidity : 0 to 95% RH
- Ambient temperature range

Standard and option /MT	: -50°C to +80°C
Option /HT (process temperature < 280°C)	: -50°C to +65°C
Option /HT (process temperature < 350°C)	: -50°C to +55°C
- Process temperature limits :

Standard	: -50°C to 150°C
Option /MT:	: -50°C to 220°C
Option /HT	: 0°C to 350°C
- Heat carrier fluid temperature limits :

Standard	: -50°C to 150°C
Option /MT:	: -50°C to 220°C
Option /HT	: 0°C to 350°C

Remote converter RCCF31 (option /EF1):

- Flame proof with intrinsic safe connection to detector (ib)
- II 2G Ex d(e) [ib] IIC T6
- II 2G Ex d(e) [ib] IIB T6 with option /HP
- II 2D Ex tD [ibD] A21 IP6x T75°C
- Max. surface temperature : 75°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Remote converter RCCF31 (option /EF2):

- Flame proof with intrinsic safe connection to detector (ib)
- Additional intrinsic safe outputs.
- II 2G Ex d(e) [ia] [ib] IIC T6
- II 2G Ex d(e) [ia] [ib] IIB T6 with option /HP
- Protection [ia] refers to the intrinsic safe outputs.
- Protection [ib] refers to the connection to the detector.
- II 2D Ex tD [ibD] A21 IP6x T75°C
- Max. surface temperature : 75°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Remote converter RCCR31 (option /ES1):

- Associated apparatus with intrinsic safe connection to detector (ib)
- II (2)G [Ex ib] IIC
- II (2)G [Ex ib] IIB with option /HP
- II (2)D [Ex ibD]
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C



WARNING

Remote rack mount converter RCCR31 must only be installed in safe area !

Integral type RCCT34 ... 39/XR (option /EF1):

- Flame proof with intrinsic safe connection to detector (ib)
- II 2G Ex d(e) [ib] IIC T6 ... T3
- II 2G Ex d(e) [ib] IIB T6 ... T3 with option /HP
- II 2D Ex tD A21 IP6x T150°C
- Max. surface temperature : 150°C
- Degree of protection : IP67
- Power supply : 90 to 250 V AC, 50/60 Hz
20.5 to 28.8 V DC
- Power consumption : max. 25 VA / 10 W
- Ambient humidity : 0 to 95% RH
- Ambient temperature range : -40°C to +55°C

Integral type RCCT34 ... 39/XR (option /EF2):

- Flame proof with intrinsic safe connection to detector (ib)
 - Additional intrinsic safe outputs.
 - II 2G Ex d(e) [ia] [ib] IIC T6 ... T3
 - II 2G Ex d(e) [ia] [ib] IIB T6 ... T3 with option /HP
Protection [ia] refers to the intrinsic safe outputs.
Protection [ib] refers to the connection to the detector.
 - II 2D Ex tD A21 IP6x T150°C
 - Max. surface temperature : 150°C
 - Degree of protection : IP67
 - Power supply : 90 to 250V AC, 50/60 Hz
20.5 to 28.8V DC
 - Power consumption : max. 25VA / 10W
 - Ambient humidity : 0 to 95% RH
 - Ambient temperature range : -40°C to +55°C
- The electronics of RCCT3 and RCCF31 are placed in a pressure tight section of the converter housing Ex d.
- The kind of protection of the terminal enclosure is "e", but can become "d" by using Ex-d certified cable glands.

Electrical data remote detector RCCS30 ... 33:

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$;
 $P_i = 0.212 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
Ex ib IIB : $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$;
 $P_i = 0.612 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 4.2 \text{ mH}$; $C_i = \text{negl. small}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$
 $C_i = \text{negligible small}$

Electrical data remote detector RCCS34 ... 39/XR:

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 53 \text{ mA}$; $P_i = 0.212 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
Ex ib IIB : $U_i = 16 \text{ V}$; $I_i = 153 \text{ mA}$; $P_i = 0.612 \text{ W}$
 $L_i = 3.2 \text{ mH}$; $C_i = \text{negligible small}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 80 \text{ mA}$; $P_i = 0.32 \text{ W}$
 $L_i = 2.1 \text{ mH}$; $C_i = \text{negligible small}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_i = 16 \text{ V}$; $I_i = 50 \text{ mA}$; $P_i = 0.2 \text{ W}$
 $L_i = \text{negligible small}$
 $C_i = \text{negligible small}$

Electrical data remote converter RCCF31, RCCR31 and converter of Integral type RCCT3:

- Driving circuit : terminals D+ / D-
Ex ib IIC : $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$;
 $P_o = 0.171 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \mu\text{F}$
Ex ib IIB : $U_o = 11.7 \text{ V}$; $I_o = 124 \text{ mA}$;
 $P_o = 0.363 \text{ W}$
 $L_o = 8 \text{ mH}$; $C_o = 10.3 \mu\text{F}$
- Sensor circuits: terminals S1+ / S1- or S2+ / S2-
Ex ib IIC : $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$;
 $P_o = 0.171 \text{ W}$
 $L_o = 15 \text{ mH}$; $C_o = 0.65 \mu\text{F}$
Ex ib IIB : $U_o = 14.5 \text{ V}$; $I_o = 47 \text{ mA}$;
 $P_o = 0.171 \text{ W}$
 $L_o = 60 \text{ mH}$; $C_o = 4.07 \mu\text{F}$
- Temperature sensor circuit : terminals TP1, TP2, TP3
Ex ib IIC : $U_o = 13.3 \text{ V}$; $I_o = 40 \text{ mA}$; $P_o = 0.133 \text{ W}$
 $L_o = 20 \text{ mH}$; $C_o = 0.91 \mu\text{F}$
Ex ib IIB : $U_o = 13.3 \text{ V}$; $I_o = 40 \text{ mA}$; $P_o = 0.133 \text{ W}$
 $L_o = 80 \text{ mH}$; $C_o = 5.6 \mu\text{F}$
- Current output (only option /KF2) :
Ex ia IIC : $U_i = 30 \text{ V}$; $I_i = 165 \text{ mA}$; $P_i = 1.25 \text{ W}$
 $L_i = \text{negligible small}$; $C_i = 6.91 \text{ nF}$
- Pulse output (only option /KF2) :
Ex ia IIC : $U_o = 30 \text{ V}$; $I_o = 100 \text{ mA}$; $P_o = 0.75 \text{ W}$
 $L_o = \text{negligible small}$; $C_o = 4.51 \text{ nF}$

**Coherence between temperature class, ambient- and medium temperature/
temperature of heat carrier :**

	RCCS30 to RCCS33 without insulation		RCCS30 to RCCS33 with factory insulation	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	50°C / 122°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
T5	50°C / 122°F	80°C / 176°F	80°C / 176°F	90°C / 194°F
T4	80°C / 176°F 50°C / 122°F	100°C / 212°F 120°C / 248°F	80°C / 176°F	130°C / 266°F
T3	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F
T2	80°C / 176°F	150°C / 302°F	80°C / 176°F	150°C / 302°F

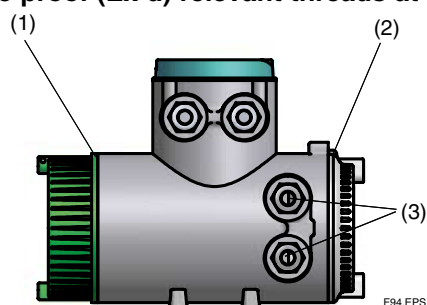
	RCCS34 to RCCS39/XR without insulation		RCCS34 to RCCS39/XR with factory insulation		RCCT34 to RCCT39/XR	
Temp. class	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
T6	40°C / 104°F	40°C / 104°F	65°C / 149°C	65°C / 149°F	+55°C / 131°F	65°C / 149°C
T5	55°C / 131°F	55°C / 131°F	75°C / 167°F	75°C / 167°F	+55°C / 131°F	80°C / 176°F
T4	80°C / 176°F 40°C / 104°F	100°C / 212°F 120°C / 248°F	70°C / 158°F	115°C / 239°F	+55°C / 131°F	115°C / 239°F
T3	80°C / 176°F 40°C / 104°F	160°C / 320°F 180°C / 356°F	70°C / 158°F	180°C / 356°F	+55°C / 131°F	150°C / 302°F
T2	80°C / 176°F	220°C / 428°F	65°C / 149°F	275°C / 527°F	+55°C / 131°F	150°C / 302°F
T1	80°C / 176°F	220°C / 428°F	45°C / 113°F	350°C / 662°F	+55°C / 131°F	150°C / 302°F



NOTE

For customer insulation of RCCS30 to 39/XR the following must be regarded :
The table "with factory insulation" is calculated with 80 mm insulation and k-factor = 0.4 W/m²K.
If your insulation data are worse than these use table "without insulation" !

Flame proof (Ex d) relevant threads at converter housing and covers:



No.	Position of thread	Pitch	Thread form + quality of pitch	Threads engaged	Depth of engagement
(1) case	Thread on electronic/display side	2 mm	medium, 6H *)	≥ 6	12 mm
(1) cover	Thread on electronic/display side	2 mm	medium, 6g *)	≥ 6	12 mm
(2) case	Thread on terminal box side	2 mm	medium, 6H *)	≥ 6	12 mm
(2) cover	Thread on terminal box side	2 mm	medium, 6g *)	≥ 6	12 mm
(3) M	Thread for cable glands M20 x 1.5	1.5 mm	medium, 6H *)	≥ 10	17 mm
(3) A/F	Thread for cable glands 1/2 " NPT	1.814 mm	**)	6.5 ± 1	13.605 mm

*) acc. ISO 965-1 and ISO 965-3

***) acc. ANSI B 1.20.1

If terminal enclosure is used as Ex e, the threads (2) and (3) in above table must be not be regarded.

9.3.2 Installation

Integral type RCCT3



WARNING

1. Ex type of ROTAMASS must be connected to the suitable IS earthing system (see installation diagram). Converter case must have connection to the potential equalisation facility. If the connecting process tubing is part of the potential equalisation, no additional connection is required.
2. Use the certified cable glands, suitable for the conditions of use. The delivered cable glands are only for Ex e use. For Ex d use certified d-type cable glands.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).

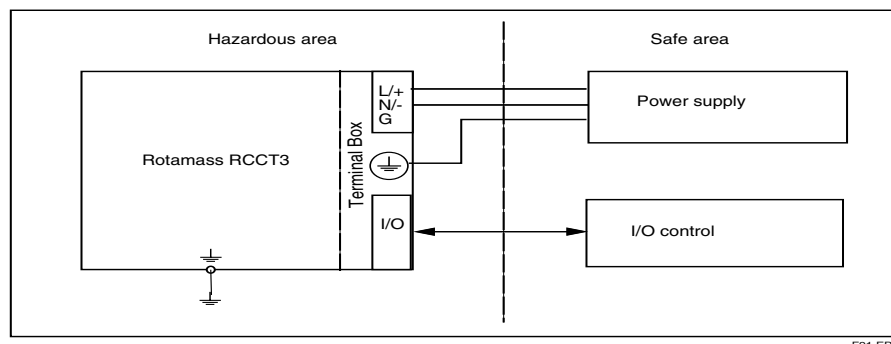
Cable glands for power- and I/O-cables :

RCCT3x-xxxM : Ex e types are enclosed. These cable glands can also be used for “dust application” tD. Use IECEx- certified Ex d cable glands for Ex d condition.

RCCT3x-xxxA : No cable glands are enclosed. Use the IECEx- certified cable glands, suitable for the conditions of use (Ex de or Ex d or tD).

For “dust application” tD use cable glands with minimum IP67 protection !

Installation diagram (option /EF1) :



Detailed information for connection intrinsic safe outputs (option /EF2 see chapter 4.4.5.

Remote field-mount type RCCF31 with RCCS3



WARNING

1. Ex type RCCF31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
2. Use the certified cable glands, suitable for the conditions of use.
3. Please confirm that the ground terminal (inside the terminal enclosure) is firmly connected by means of a clip-on eye-let.
4. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Cable glands for power- and I/O-cables :

RCCF31-xxxM : Ex e types are enclosed. These cable glands can also be used for “dust application” tD. Use IECEx- certified Ex d cable glands for Ex d condition.

RCCF31-xxxA : No cable glands are enclosed. Use the IECEx- certified cable glands, suitable for the conditions of use (Ex de or Ex d or tD)

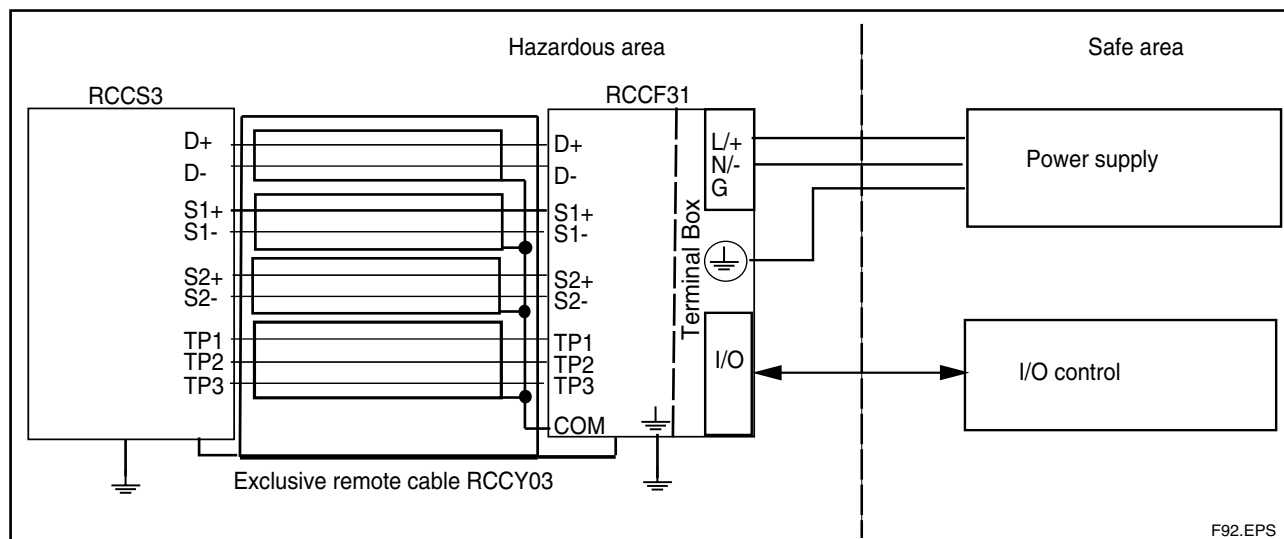
For “dust application” tD use cable glands with minimum IP67 protection !

Cable glands for detector connection terminal :

RCCF31-xxxM : Cable glands are fitted in the concerning thread. This cable gland can also be used for “dust application” tD.

RCCF31-xxxA : Cable glands are enclosed. This cable gland can also be used for dust application” tD.

Installation diagram (option /EF1) :



The inner shields (shields of the cable pairs) are connected together to COM –terminal on converter side. The outer shield of the cable is connected on both sides to the cases by cable gland.

Detailed information for connection intrinsic safe outputs (option /EF2) see chapter 4.8.8.

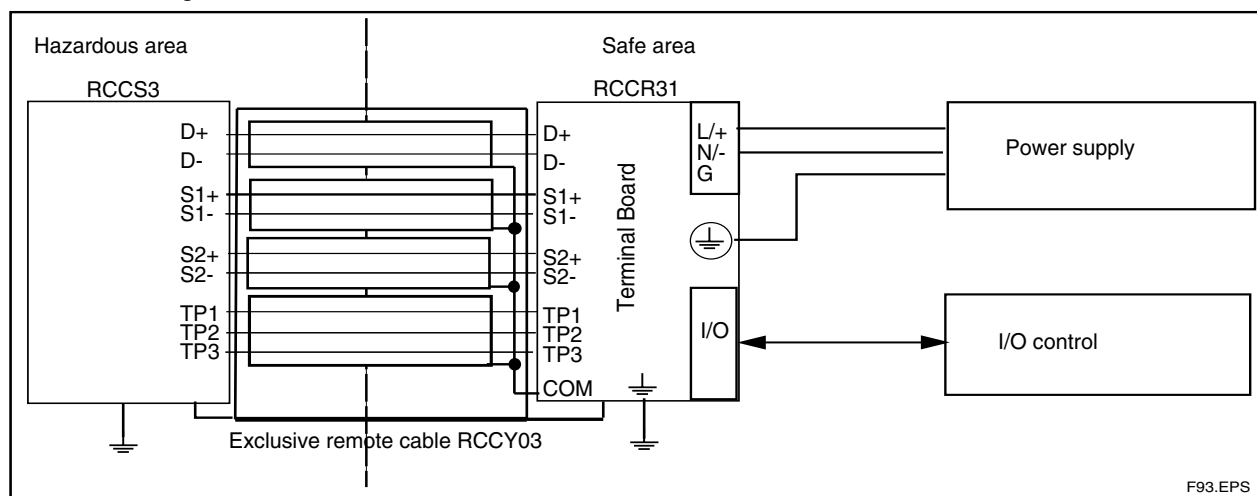
Remote rack-mount type RCCR31 with RCCS3



WARNING

1. Remote rack mount converter RCCR31 must only be installed in safe area !
2. Ex-type RCCR31 and RCCS3 must be connected to the suitable IS earthing system (see installation diagram). Converter and detector case must have connection to the potential equalisation facility.
3. Please confirm that the ground terminal on terminal board is firmly connected.
4. Ex-e terminals for power supply and I/O-lines are designed for cables with cross section of 0.08 mm² (AWG 28) to 2.5 mm² (AWG 22). The strip length must be 5 to 6 mm (0.2 to 0.24 in).
5. For EMC technical reasons the case of the detector is connected to the case of the converter via the shielding of the interconnecting cable.

Installation diagram :



9.3.3 Operation

If the cover of the converter RCCF31 / RCCT3 has to be opened, following instructions must be followed.



CAUTION

1. Confirm that the power cables to the instrument are disconnected.
2. Wait 15 minutes after power is turned off before opening the covers.
3. The covers of display side and terminal box are fixed with special screws, please use Hexagonal wrench to open the covers.
4. Be sure to lock the cover with special screw using the Hexagonal Wrench after tightening the cover (see drawing chapter 4.3).
5. Before starting the operation again, be sure to lock the cover with the locking screws.
6. Prohibition of specification changes and modifications. Users are prohibited from making any modifications of specifications or physical configuration, such as adding or changing the configuration of external wiring ports.

9.3.4 Maintenance and repair



WARNING

The instrument modification of parts replacement by other than authorized representatives of YOKOGAWA is prohibited and will void the certification.

9.3.5 Ex-relevant marking on name plates (refer to chapter 3.11)**RCCT3 option /EF1:**

IECEX KEM 06.0031X

Ex d [ib] IIC T6...T3 or Ex de [ib] IIC T6...T3

Ex tD A21 IP6x T150°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T150°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCT3 option /EF1 + /HP:**

IECEX KEM 06.0031X

Ex d [ib] IIB T6...T3 or Ex de [ib] IIB T6...T3

Ex tD A21 IP6x T150°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T150°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCT3 option /EF2:**

IECEX KEM 06.0031X

Ex d [ia][ib] IIC T6...T3 or Ex de [ia][ib] IIC T6...T3

Ex tD A21 IP6x T150°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T150°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCT3 option /EF2 + /HP:**

IECEX KEM 06.0031X

Ex d [ia][ib] IIB T6...T3 or Ex de [ia][ib] IIB T6...T3

Ex tD A21 IP6x T150°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T150°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCF31 option /EF1:**

IECEX KEM 06.0031X

Ex d [ib] IIC T6 or Ex de [ib] IIC T6

Ex tD [ibD] A21 IP6x T75°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T75°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCF31 option /EF1 + /HP:**

IECEX KEM 06.0031X

Ex d [ib] IIB T6 or Ex de [ib] IIB T6

Ex tD [ibD] A21 IP6x T75°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T75°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCF31 option /EF2:**

IECEX KEM 06.0031X

Ex d [ia][ib] IIC T6 or Ex de [ia][ib] IIC T6

Ex tD [ibD] A21 IP6x T75°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T75°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.**RCCF31 option /EF2 + /HP:**

IECEX KEM 06.0031X

Ex d [ia][ib] IIB T6 or Ex de [ia][ib] IIB T6

Ex tD [ibD] A21 IP6x T75°C

ENCLOSURE IP67

DIODE SAFETY BARRIER U: 250V

SEE CERTIFICATE FOR DATA

MAX. SURFACE TEMP.: T75°C

**WARNING**WAIT 15 MIN. AFTER POWER-DISCONNECTION
BEFORE OPENING THE ENCLOSURE.

9. EXPLOSION PROTECTED TYPE INSTRUMENTS

RCCR31 option /ES1:

IECEX KEM 06.0031X
II (2)G [Ex ib] IIC
II (2)D [Ex ibD]
DIODE SAFETY BARRIER U: 250V
SEE CERTIFICATE FOR DATA

RCCR31 option /ES1 + /HP:

IECEX KEM 06.0031X
II (2)G [Ex ib] IIB
II (2)D [Ex ibD]
DIODE SAFETY BARRIER U: 250V
SEE CERTIFICATE FOR DATA

RCCS30 to 39/XR option /ES1:

IECEX KEM 06.0031X
Ex ib IIC/IIB T1...T6
Ex ibD 21 IP6x T150°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA
MAX. SURFACE TEMP.: 150°C

RCCS30 to 39/XR option /ES1 + /MT:

IECEX KEM 06.0031X
Ex ib IIC/IIB T1...T6
Ex ibD 21 IP6x T220°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA
MAX. SURFACE TEMP.: 220°C

RCCS30 to 39/XR option /ES1 + /HT:

IECEX KEM 06.0031X
Ex ib IIC/IIB T1...T6
Ex ibD 21 IP6x T350°C
ENCLOSURE: IP67
SEE CERTIFICATE FOR DATA
MAX. SURFACE TEMP.: 350°C

9.4 INMETRO (Brazil)

RCCS3x with option /US1 same as IECEX /ES1
RCCT3x with options /UF1 ... /UF2 same as IECEX EF1 ... /EF2
RCCR31 with options /UF1 ... /UF2 same as IECEX EF1 ... /EF2
RCCR31 with option /US1 same as IECEX /ES1
Same parameters and specifications as IECEX approval.
See chapter 9.3.

9.5 Gost approval

Rota Yokogawa has the "Pattern Approval Certificate of Measuring Instruments" which allows to export the instrument to Russia, Kazakhstan, Uzbekistan and other CIS countries. Furthermore ROTAMASS is RTN (GGTN) approved for installation in hazardous areas. For the export of ROTAMASS to CIS countries please contact your Yokogawa representative.

10. PED (PRESSURE EQUIPMENT DIRECTIVE)

All materials containing pressure (process connections, flow divider and tubes) are traced back to the original manufacturer with a material certificate. The PED limits the pressure and temp, which can be found below.



WARNING

The given temperature /pressure ranges are calculated and approved without corrosion or erosion. The customer is fully responsible to select proper materials to withstand his corrosive or erosive conditions. In case of heavy corrosion and/or erosion the instrument may not withstand the pressure and an incident may happen with human and/or environmental harm. Yokogawa will not take any liability regarding damage caused by corrosion / erosion. If corrosion/erosion may happen, the user has to check periodically if the necessary wall thickness is still in place.

ROTAMASS is produced according the determinations of directive 97/23/EG (Directive for Pressure Equipment / PED). The units are classified as pipe according item 3, number 1, 3. letter, a) first dash or according diagram 6 after appendix II :

Classification as pipe

For Fluid Group 1 and 2 (article 9 chapter (2)); For fluid group 2 with a max. partial pressure of 1.5bar at T_{max} .

Medium liquid and gas

The basic safety requests (for design, production and testing) for all units according to category I to III are generally determined for the requests of category III. The units, which are not included by PED, article 3 paragraph 3, are checked by a conformity-valuation-methode according appendix III "module H".

The complete quality assurance system according PED appendix III module H was certified by the notified body :

Lloyd's Register Nederland B.V.; Weena-Zuid 170; NL-3012 NC Rotterdam
ID-No. 0038

Number is printed on name plates (see chapter 3.11).

For the application the following notes have to be noticed :

Permitted maximum operating temperatures:

The pressure relevant temperature limits of the detector are : -200 to 400°C

These limits are reduced by measuring boundary conditions :

General : -40 to 150°C

Additional reductions for the use of special connections (clamp, pipe screwing ...) have to be noticed according the concerning standards.

10. PED (PRESSURE EQUIPMENT DIRECTIVE)

Dependence of the max. permitted effective pressure of the operating temperature:

a) for Standard process connections

Type of process connection ¹⁾		Process Temperature							
		RT ²⁾	50°C	100°C	150°C	200°C	250°C	300°C	350°C
A1	Flange acc. ASME B16.5 Class 150	15.9 bar	15.3 bar	13.2 bar	12.0 bar	11.0 bar	10.2 bar	9.7 bar	8.4 bar
A2	Flange acc. ASME B16.5 Class 300	41.4 bar	40.0 bar	34.5 bar	31.2 bar	28.7 bar	26.7 bar	25.2 bar	24.0 bar
A3	Flange acc. ASME B16.5 Class 600	82.7 bar	80.0 bar	69.9 bar	62.8 bar	58.3 bar	54.9 bar	52.1 bar	50.1 bar
A4	Flange acc. ASME B16.5 Class 900	124.1 bar	120.1 bar	104.4 bar	94.2 bar	87.5 bar	82.4 bar	78.2 bar	75.2 bar
A5	Flange acc. ASME B16.5 Class 1500	206.8 bar	200.1 bar	173.9 bar	157.0 bar	145.8 bar	137.3 bar	130.3 bar	125.4 bar
D2	Flange acc. EN 1092-1 PN 16	16 bar	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar
D4	Flange acc. EN 1092-1 PN 40	40 bar	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar
D5	Flange acc. EN 1092-1 PN 63	63 bar	61.6 bar	56.0 bar	50.4 bar	46.2 bar	42.8 bar	40.6 bar	38.9 bar
D6	Flange acc. EN 1092-1 PN 100	100 bar	97.7 bar	97.7 bar	80.0 bar	73.3 bar	68.0 bar	64.4 bar	61.8 bar
G9	Internal thread RCCS30...33)	See tube pressure, for option /DS max. pressure according A4, ASME class 900				-----			
T9	Internal thread NPT (RCCS30...33)	See tube pressure, for option /DS max. pressure according A4, ASME class 900				-----			
G9	Internal thread (RCCS34)	See tube pressure, for option /DS max. pressure according A4, ASME class 900							
T9	Internal thread NPT (RCCS34)	See tube pressure, for option /DS max. pressure according A4, ASME class 900							
		Process Temperature							
		up to 120°C				220°C		300°C	350°C
J1	Flange acc. JIS B 2220 10K	14 bar				12 bar		10 bar	-----
J2	Flange acc. JIS B 2220 20K	34 bar				31 bar		29 bar	26 bar
		Process Temperature							
		up to 140°C ¹⁾							
S2	Pipe connection up to DN 40	40 bar				¹⁾ under the restriction using suitable gasket materials			
	acc. DIN 11851 DN 50 to DN 100	25 bar							
	above DN 100	16 bar							
		Process Temperature							
		up to 150°C ²⁾							
S4	Clamp connection up to DN 50	16 bar				²⁾ under the restriction using suitable gasket materials			
	acc. DIN 32676 above DN 50	10 bar							
S8	Clamp acc. Mini-Clamp up to 1/2''	16 bar							
	Clamp acc. Tri-Clamp up to 2''	16 bar							
	above 2''	10 bar							

¹⁾ all process connections acc. AISI 316L (1.4404 / 1.4435)

²⁾ RT = Room Temperature: EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C

¹⁾ all process connections acc. AISI 316L (1.4404 / 1.4435)

²⁾ RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C

b) for special process connections

For customer-built models with Z-No. (Option /Z) different values may be valid.

These details are written on the name plate (field 13).

Special connections	Medium temperature								
	-200°C	RT	50°C	100°C	150°C	200°C	250°C	300°C	350°C
Flange ASME >300	100%	100%	94.2%	83.3%	75.8%	69.5%	64.3%	60.8%	58.0%
Flange DIN PNxxx	100%	100%	96.5%	55.5%	80.5%	74.3%	69.8%	64.5%	61.8%
Other connections	100%	100%	96.5%	55.5%	80.5%	74.3%	69.8%	64.5%	61.8%
	PS *)								

*) Details see name plate (item (2)).

**) The statements only refer to the connection at the unit, further reductions by gaskets and customer-sided connection parts have to be considered separately.

Rating of flange connections

The user must dimension bolts and nuts as depending of pressure, temperature, flange material and seal, so that the flange connection remains tight in the expected operating conditions.

The basic of calculation may be:

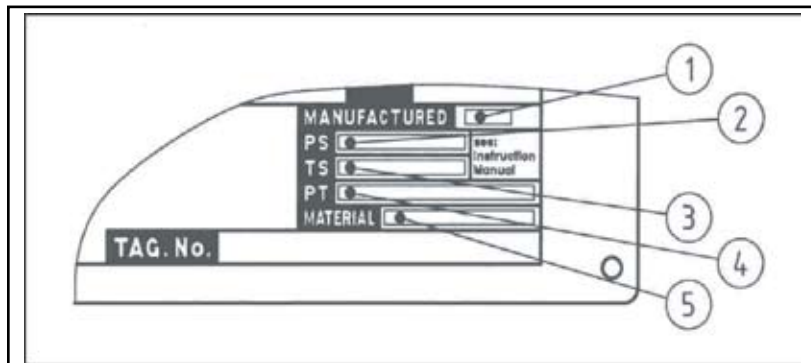
- EN 1515 part 1+2 (bolts and nuts)
- EN 1591 part 1+2 (flanges and seals)

For certain sealing materials it may occur that the sheet thickness of the flange at utilization of the full pressure range (eg, PN) is no longer of sufficient size.

The user is responsible to take necessary measures before ordering, for example:

- selection of flanges with higher pressure rate
- selection of flanges with a flange face which is more thick as according standard

PED-data on the name plate of RCCT3x



- 1) Year of manufacturing
- 2) Max. permitted pressure at room temperature, for other temperatures see table
- 3) Max. permitted temperature range
- 4) Test pressure, for standard units without value, because in this case generally
 $PT=1.5 \times PS$
- 5) Material of medium wetted parts with pressure load

Operation restriction:

The operator is responsible that no corrosion and/or erosion is caused by the medium, which reduces the safety of the unit as pressure vessel. Corrosion and erosion can make the unit fail and can lead to the endangering of persons and facilities. If corrosion and erosion are possible, the integrity of the tubes has to be checked periodically.

The following usages of the instruments are not permitted:

- use as climbing aid (e.g. during assembling work on pipe system)
 - use as support for external load (e.g. support for piping) or tray surface for heavy tools (e.g. during piping work)
 - Material removal by any kind of machining (e.g. drilling, sawing etc.)
 - Painting of the name-plate
 - Brazing or welding of parts to the instrument
 - Any repair, modification or supplements or the installation of spare-parts is only permitted if it is done in accordance to this instruction manual. Other work must be agreed by YOKOGAWA beforehand.
- YOKOGAWA will not take over any liability for damages caused by unauthorized work on the instrument or prohibited usage of the instrument.

10. PED (PRESSURE EQUIPMENT DIRECTIVE)

Information of potential hazardous situations:

	Endangering by:	Description	Remarks
Medium	Surface temperature	Surface temperature is hot in case of high process temperature. It is the sole responsibility of the user to establish proper means to prevent touching of the detector (see also chapter 11.1).	
	Max. / Min. process temperature	See chapter 11.1	
	Max. process pressure	See chapter 11.1	
	Tightness of the wetted, PED relevant volume	A factory test is done before delivery	
	Corrosion and erosion effects	It is the sole responsibility of the user to select proper wetted materials for the medium intended to use (see chapter 10).	
	Life time evaluation	Experience shows that the lifetime of the detector within the allowed operation conditions is more than 10 years.	Without erosion and corrosion.
	Temperature shock	Permanent temperature cycles of more than 100°C temp. difference have to be avoided. Tube failure can occur because of material wearing.	
	Instable fluids	If instable fluids are transported it is the sole responsibility of the user that in case of decomposition the design limits are not exceeded.	
Installation	Process pressure/temp. relation	See chapter 10	
	Piping and support forces	See chapter 4.3	
	Choice of gaskets and pre-stress of the process connections	It is the sole responsibility of the user to select suitable gaskets and to screw the process connections with the necessary torques.	Refer to EN 1591-1
	Use of closing and openings	Do not open the 1/4 NPT plugs in the body after tube failure before it is ensured that the housing is pressure free and free of hazardous substances.	
	Pressure shock, water hammer and pressure surges	Dynamical exceeding of the given max. pressure at process temp. has to be avoided.	Water hammer can lead to tube failures.
	Filling and emptying of the pipe work	The detector is part of a pipe work. It has to be taken into account that fluid can remain in the measuring tubes.	
	Disposal, cleaning and return	See chapter 1.5	
	Flow direction of the unit	See chapter 4.1 and marking on the detector.	After installation with wrong flow direction only indication error (wrong sign, can be corrected via software)
	Installation position of the unit	See chapter 4.3	A wrong installation position gives only measuring disturbances
	Pipe stress by weight of the instrument	See chapter 4.3	
Outer influence	Permitted ambient conditions (temperature, humidity)	See chapter 11.1	
	External fire	External fire can result in - Rise in pressure by temperature - Damage of gaskets It is in the sole responsibility of the user to implement suitable means to prevent large damage in the case of fire.	The instrument itself does not contain flammable materials.
	Earthquake resistance	Damage of the mounting screws	Check by user

T101.EPS

11. TECHNICAL DATA

11.1 Specifications

PERFORMANCE SPECIFICATIONS

Model

- Remote detector RCCS30 to 33: 2 tubes, low flow design
- Remote detector RCCS34 to 39/XR: 2 tube design
- Remote field-mount converter RCCF31
- Remote rack-mount converter RCCR31
- Integral type RCCT34 to 39/XR: 2 tube integral design

Fluid to be measured : Liquid, gas or slurries

Measurement Items : Mass flow, density, temperature and derived from these values: concentration, volume flow and net flow

Mass Flow Measurement

Table 11-1: measuring range

Type		RCCS30	RCCS31	RCCS32	RCCS33
Qmax	t/h	0.1	0.3	0.6	1.5
Qnom	t/h	0.045	0.17	0.37	0.9

Type		RCCx34	RCCx36	RCCx38	RCCx39	RCCx39 /IR	RCCx39 /XR
Qmax	t/h	5	17	50	170	300	600
Qnom	t/h	3	10	32	100	250	500

Qnom is the water flow rate at about 1 bar pressure drop.
The flowmeter has a default low cut of 0.05% of Qnom.

Accuracy mass flow :

- Liquid : $\pm 0.1\%$ of flow rate
 $\pm$ zero stability / flow rate *100%
 (refer to table 11-2)
- Gas (option /GA) : $\pm 0.5\%$ of flow rate
 $\pm$ zero stability / flow rate *100%
 (refer to table 11-2)

Accuracy volume flow :

$\text{SQRT} ((\text{mass flow error in } \%)^2 + (\text{density error in } \%)^2)$

Please refer to the Yokogawa sizing software.

Accuracy based on the frequency output includes the combined effects of repeatability, linearity and hysteresis.

Repeatability for liquids: $\pm 0.05\%$
 $\pm$ (zero stability/2) / flow rate*100%

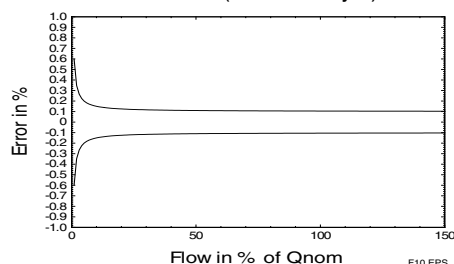


Table 11-2 : Zero Stability

Type	RCCS30	RCCS31	RCCS32	RCCS33
kg/h	0.005	0.0085	0.019	0.045

Type	RCCx34	RCCx36	RCCx38	RCCx39	RCCx39 /IR	RCCx39 /XR
kg/h	0.15	0.5	1.6	5	13	25

Pressure Dependency

The stiffness of the ROTAMASS tubes is slightly line pressure dependent. The static pressure effect of mass flow and density can be corrected by setting the static pressure manually via menu.

Table 11-3 : Static pressure effect on mass flow (if not corrected)

Type		RCCS30	RCCS31	RCCS32	RCCS33	RCCx34
% of rate per bar	SS	----	----	----	----	0.00081
	HC	0.00000	0.00012	0.00246	0.02094	0.00084
Type		RCCx36	RCCx38	RCCx39	RCCx39 /IR	RCCx39 /XR
% of rate per bar	SS	0.00346	0.00950	0.01058	0.02920	0.00740
	HC	0.00336	0.00896	0.00808	0.01780	----

Density Measurement

Adjustment with water and air at calibration temperature.

With option /K4 thermal stabilized.

For option /K6 see also "Special calibrations" on page 11-2.

Measuring range: 0.3 kg/l to 5 kg/l (RCCx39, RCCx39/IR and RCCx39/XR to 2 kg/l)

No density measurement for gas application

Table 11-4: Accuracy (at calibration conditions):

Type	Standard	option /K4	option /K6
RCCS30	0.008 g/cm ³	-----	-----
RCCS31	0.004 g/cm ³	0.001 g/cm ³	-----
RCCS32	0.004 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCS33	0.004 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCx34	0.003 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCx36	0.0022 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCx38	0.0015 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCx39	0.0015 g/cm ³	0.001 g/cm ³	0.0005 g/cm ³
RCCx39/IR	0.0015 g/cm ³	-----	-----
RCCx39/XR	0.0015 g/cm ³	-----	-----

Repeatability:

- RCCS32-33, RCCx34-39/XR : $\pm 0.0005 \text{ g/cm}^3$ (Std, /K4)

Static pressure effect:

Compensated if static pressure is set in the menu

Specification of high performance density measurement (option /K6):

Ambient temp. range : -10°C to 50°C

Fluid temp. range : -50°C to 150°C

Minimum flow rate for specified accuracy:

- RCCx36 to RCCx39 : 700 kg/h

- RCCx34 : 140 kg/h

- RCCS33 : 90 kg/h

- RCCS32 : 37 kg/h

Maximum flow rate : Qnom

Repeatability : $\pm 0.0002 \text{ g/cm}^3$

Temperature measurement: $\pm 0.5^\circ\text{C} \pm 0.2\%$ of reading
 Density accuracy : $\pm 0.0005 \text{ g/cm}^3$ (liquids not aerated / no gas in the liquid)

Process temperature influence :

$0.000015 \text{ g/cm}^3 \cdot \text{abs}(T_{\text{fluid}} - 20^\circ\text{C})$

11. TECHNICAL DATA

Temperature Measurement

Temperature measuring range of converter :

Standard, /LT, /MT : -200°C to 230°C

/HT : 0°C to 400°C

Accuracy:

Standard (-70°C to 150°C) : $\pm(0.5^\circ\text{C} + 0.005 \cdot \text{abs}(T_{\text{medium}} - 20^\circ\text{C}))$

/MT (-70°C to 230°C) : $\pm(0.5^\circ\text{C} + 0.005 \cdot \text{abs}(T_{\text{medium}} - 20^\circ\text{C}))$

/LT (-200°C to 150°C) : $\pm(1.0^\circ\text{C} + 0.008 \cdot \text{abs}(T_{\text{medium}} - 20^\circ\text{C}))$

/HT (0°C to 400°C) : $\pm(1.0^\circ\text{C} + 0.008 \cdot \text{abs}(T_{\text{medium}} - 20^\circ\text{C}))$

For process temperatures more than 80°C higher/lower than ambient temperature the detector should be insulated to maintain optimum accuracy.

Heating Tracing

Heating with heat carrier, insulation and protection housing. The max. surface temperature at the protection housing from inner heating is 40°C. Above 150°C process temperature insulation from the manufacturer is recommended. However up to 230°C process temperature the customer can insulate the detector themselves.

Option /T1 : only insulation and protection

Option /T2 : insulation, protection and heating line

Option /T3 : like /T2 but with ventilation

Process connection for the heat carrier fluid (see table 11-9):

for D-type flanges : EN DN 15 PN 40 Form B1

for A-type flanges : ANSI ½ - 150 lbs.

for J-type flanges : JIS DN15 10K

Max. pressure : PN 40

Protection class : IP54, install roof protected

For fluid temperatures below -70°C select option /LT and ask for special insulation (see also page 11-5).

Calibration for Liquids and Gases :

The ROTAMASS flowmeters are always factory calibrated with water. Calibration Conditions:

- Water : 22.5°C ± 12.5°C

- Ambient temperature : 22.5°C ± 12.5°C

- Process Pressure : 1 to 2 bar abs

- Installation: RCCS/30 to RCCS/T38 vertical

RCCS/T39 to RCCS/T39/XR horizontal

All specifications are based on above mentioned calibration reference conditions, a flow calibration protocol is attached to each instrument.

Special Calibrations

- Mass-/Volume flow calibration with factory certificate (option /K2): Calibration with water at customer specified flow values according calibration order sheet.

- Mass-/Volume flow calibration with DKD certificate (EN17025: 2005) (option /K5):

Calibration with water at customer specified flow values according calibration order sheet.

- Density calibration with factory certificate (option /K6) (not with /GA):

Adjustment and check with 3 different fluids, fluid temperature influence adjustment for low ambient temperature influence and thermal treatment for long term density measurement stability, enhanced temperature measurement (see also page 11-6).

Dual Seal Approval (option /DS):

- Conform with ANSI/ISA-12.27.01.

- Only for use with hazardous substances.

- Up to ANSI class 900 line pressure.

- Only with FM approval option.

- For liquid application the leakage detection is realized by software in the converter.

- For gas application options /GA and /RD (rupture disk) are mandatory.

- Rupture disk is only for annunciation.

NORMAL OPERATING CONDITIONS

Ambient Temperature Limits

- Remote detector RCCS3 :

Standard + /LT : -50°C to +80°C

Option /HT : -50°C to +65°C

(up to 280°C medium temperature)

-50°C to +55°C

(up to 350°C medium temperature)

terminal box lower 100°C

- Remote converter RCCF31, RCCR31 and Integral type RCCT3:

Display work. range : -20°C to +55°C

Electronic work. range : -40°C to +55°C

Cold start : above -30°C

Where meters are mounted in direct sunlight, it is recommended to install a sunshade. This is particularly important in countries with high ambient temperatures.

Ambient Humidity Limits : 0 to 95% RH

Process Temperature Limits

Detector :

- RCCS30 to 33 : -50°C to 150°C

- RCCS34 to 39/XR : -70°C to 150°C

- RCCS34 to 39/XR /MT : -70°C to 230°C
(Range 150°C – 230°C recommended with /Tx option)

- RCCS34 to 39/XR /LT : -200°C to 150°C

- RCCS34 to 39/IR /HT : 0°C to 350°C (only with /Tx option)

For use in hazardous area -50°C is low limit.

Integral type :

- RCCT34 to 39/XR : -50°C to 150°C

Heat Carrier Fluid Temperature Limits

(option /T2 or /T3 only for remote type RCCS30 to 39/IR)

- Standard : 0°C to 150°C

- With option /MT : 0°C to 230°C

- With option /HT : 0°C to 350°C

- With option /LT : -200°C to 150°C

For fluid temperatures below -70°C select option /LT and ask for special insulation (see also page 11-5).

Process Pressure Limits

According to the flange ratings:

- EN PN 16 : max. 16 bar

- EN PN 40 : max. 40 bar

- EN PN 63 : max. 63 bar

- EN PN 100 : max. 100 bar

- ASME class 150 : max. 16 bar

- ASME class 300 : max. 41 bar

- ASME class 600 : max. 83 bar

- ASME class 900 : max. 124 bar

- ASME class 1500 : max. 207 bar

- JIS 10K : max. 14 bar (1.4 MPa)

- JIS 20K : max. 34 bar (3.4 MPa)

The RCCS30 to RCCS34 have also thread connection. For this connections the max. allowed tube pressure is the limitation. For all other standard process connection please find the max. process pressure in table 11-8.

Maximum tube pressure for SL/SH up to 27°C (RT=Room Temp.):

- RCCS30 / 31 / 32	: 285 bar
- RCCS33	: 185 bar
- RCCS34 / RCCT34	: 260 bar
- RCCS36 / RCCT36	: 210 bar
- RCCS38 / RCCT38	: 175 bar
- RCCS39 / RCCT39	: 135 bar
- RCCS39/IR / RCCT39/IR	: 110 bar
- RCCS39/XR / RCCT39/XR	: 95 bar

For higher medium temperatures maximum tube pressure needs to be derated as follows :

up to 50 °C	:	4%	derating
51 to 100 °C	:	11%	derating
101 to 150 °C	:	20%	derating
151 to 230 °C	:	30%	derating
231 to 350 °C	:	38%	derating

Higher pressure on request.

The maximum process pressure of a single instrument is given by the lower value either of the process connections (table 9) or tubes. The maximum temperature and process pressure limits of an instrument are marked on the name-plate as TS and PS.

The given temperature / pressure ranges are calculated and approved without corrosion or erosion. The customer is fully responsible to select proper materials to withstand his corrosive or erosive conditions. In case of heavy corrosion and/or erosion the instrument may not withstand the pressure and an incident may happen with human and/or environmental harm. Yokogawa will not take any liability regarding damage caused by corrosion / erosion. If corrosion/erosion may happen, the user has to check periodically if the necessary wall thickness is still in place.

Gas Content Limits for Liquid/Gas Mixtures

Gas content limit is defined as the amount of gas in a liquid/gas mixture which generates an error (frequency error) in the converter. The gas content limit is dependent on viscosity, surface tension and bubble size of the liquid/gas mixture. Furthermore it is highly flow rate dependent (the higher the flow rate, the lower the gas content limits). The stated values are for a flow of 50% of Qnom and water/air without /HP:

- RCCS30 to 32	: no limitation
- RCCS33 non-Ex type	: no limitation
- RCCS33 Ex type	: approx. 35%
- RCCx34	: no limitation
- RCCx36	: approx. 50%
- RCCx38	: approx. 30%
- RCCx39	: approx. 7%
- RCCx39/IR	: approx. 3%
- RCCx39/XR	: approx. 2% (with option /HP)

With option /HP the gas content limits are improved.

With liquid/gas mixtures the specified mass flow accuracy will not be achieved.

For short time aeration a function can be activated to keep the current outputs constant during the aeration time.

Secondary Containment

The housings of the RCCS30-33 and the RCCx39/XR are not rated for secondary containment. Rupture pressure for RCCx34-38 is typical above 120bar, for RCCx39 above 80 bar, for RCCx39IR above 50bar.

However if the detector housing is exposed to this pressure it will deform and measurement will be strongly influenced. Therefore the pressure test of the housing (option /J1) can only be done at the pressure where deformation does not happen.

Other 2 Phase Flow, liquid/solid and liquid/liquid

Two phase flow can generate minus span errors. The errors are proportional to the difference in density between the 2 phases and the amount of the second phase. If the particles (or droplets) are very small no errors will be generated.

Power supply and Power Consumption

- AC-type	: 90 to 264 V AC, 47-63 Hz
	For Ex version 250 V AC max.
- DC-type	: 20.5 to 28.8 V DC
Consumption	: max. 25VA / 10W

MECHANICAL SPECIFICATIONS

Protection Class

- RCCT3x	: IP66/67
- RCCF31	: IP66/67
- RCCS3x	: IP66/67
- RCCS3x with /Tx	: IP54
- RCCR31	: IP20

Materials

- Detector housing	: Stainless steel 304/1.4301
- Detector terminal box	: 316L/1.4404
- Detector gas filling plug:	1.4305
- Detector rupture disk (/RD) :	316L
- Field- mount converter housing	: Aluminium alloy with Polyurethane corrosion-resistant coating or epoxy coating (option /X1)
- Rack- mount converter housing	: Aluminium

Coating Color

- Field-mount converter case	: Mint green
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Wetted Parts

- RCCS30 to 33 :	
Tubes	: Hastelloy C-22/2.4602
Process connections :	316L / 1.4404
- RCCx34 to 39/IR :	
Tubes and process connection	: 316L / 1.4404/1.4435 or Hastelloy C-22/2.4602
- RCCx39/XR :	
Tubes and process connection	: 316L / 1.4404

Table 11-5 : Diameter of measuring tubes

Type		RCCS30	RCCS31	RCCS32	RCCS33
Inner diameter	mm	1.2	2.1	3	4.5
Wall thickness	mm	0.2	0.25	0.25	0.25

Type		RCCx34	RCCx36	RCCx38	RCCx39	RCCx39 /IR	RCCx39 /XR
Inner diameter	mm	7.7	13.4	22.1	37.2	55.1	82.50
Wall thickness	mm	0.89	1.24	1.65	2.6	2.9	3.2

Pressure Equipment Directive 97/23/EC

- Module : H; Fluid group : 1; Category : III	
RCCx34-RCCx38	: Fluid group 2, SEP
RCCx39-RCCx39/XR	: Fluid group 2, Cat. I

For all Process Connections: CRN 0F12074.5

11. TECHNICAL DATA

ELECTRICAL SPECIFICATIONS

Power Supply

- AC- type : 90 V to 264 V
90 V to 250 V for Ex-type
 - DC- type : 20.5 V to 28.8 V
- External circuit breaker rating : 5 A, 250 V (In the converter no power switch is installed).

Fuse on Base Board :

- AC- type : 2 A, T, breaking capacity 1500A
- DC- type : 2 A, T, breaking capacity 1500A

I/O Signals

- Two active current outputs:
4 to 20 mA DC, galvanic separated from other signals,
Load resistance : 20 Ω to 600 Ω
Failure current according NAMUR NE43
Ambient temperature effect : < 0.05% of span/10°C
Linearity : 0.008 mA = 0.05% of span
Setting range URV for liquids: 5 to 100% of Qnom
Setting range URV for gases: 1 to 100% of Qnom
- Two Pulse outputs / status outputs :
Passive Transistor contact output, 30 V DC, 200 mA
Output rate :
Output 1 : 0 to 10000 pulses/s
Output 2 : 0 to 2000 pulses/s
Option /NM : passive, according EN 60947-5-6
Option /AP : active output, 12 V, 6 mA, $R_L > 10$ k Ω
Active pulse output is not isolated from current output 2
As frequency output :
Output 1 : 20 Hz to 10000 Hz
Output 2 : 20 Hz to 2000 Hz
- Status input : Voltage-free contact
Closed : < 200 Ω
Open : > 100 k Ω

Option /KF2, /EF2, /UF2: 2 intrinsic safe Outputs

- One passive current output (additional power supply needed) :
4 to 20 mA DC, galvanic separated from other signals.
Supply voltage 10.5 V to 30 V DC (without HART), 165 mA
Supply voltage 16.75 V to 30 V DC (with HART), 165 mA.
Load resistance : 20 Ω ... 600 Ω
Ambient temperature effect : < 0.05% of span/10°C
- One pulse output / status output :
Passive Transistor contact output, 30 V DC, 100 mA
Output rate : 0 to 2000 pulses/s
As frequency output : 20 Hz to 2000 Hz
Option /NM : passive, according EN 60947-5-6
- No status input

Digital Communication

- HART communication protocol rev. 5, superimposed on 4 -20 mA DC signal (Iout1)
- Load resistance : 230 Ω to 600 Ω (including cable)
- Power line spacing : >15 cm, avoid parallel wiring
- Cable length : ≤ 2 km if „CEV“ cables are used
- Foundation Fieldbus communication (/FB)
- see GS 01R04B05-00E

Setting Functions

Parameter setting is possible by using the switches on the display or with HART communication.

Display Function

- Up to 4 lines.
- 4 languages selectable (English, German, French, Russian)

Damping Functions

Adjustable from 0 seconds to 200 seconds, controls display and outputs.

Isolation Resistance of Converter

When surge arrestors are removed

- between power and ground terminal: 100 M Ω / 500 V DC
- between power and I/O terminals : 20 M Ω / 100 V DC
- between I/O terminals and ground : 20 M Ω / 100 V DC

Dielectric Strength

When surge arrestors are removed

- between power and ground terminal : 1,500 V AC for 1 minute

Lightning Protection

Arresters (2000 A) are inside converter for power supply lines.

EMC

- Acc. EN 61326-1: 2006; EN 61326-2-3: 2006;
EN 61000-3-2: 2006; EN 61000-3-3: 1995+A1+A2

REMOTE CABLE RCCY03 SPECIFICATION

Li2Y(St)/CY 3x2 AWG24 + 1x3 AWG20

pair/triple shielded; pair/triple twisted; overall shielding

RCCY033/034 and RCCY031/032/KS1: flame propagation acc. IEC 60332-1.

Table 11-7: Cable specifications

Model code	Temperature range	Wire gauge	Resistance of loop	Capacitance wire/wire	Capacitance wire/shield	Inductance wire/wire
RCCY031/032	-50 to +70°C	AWG 24 AWG 20	190 Ω /km 70 Ω /km	157 nF/km 193 nF/km	249 nF/km 290 nF/km	0.60 mH/km 0.65 mH/km
RCCY031/032 /KS1	-50 to +70°C	AWG 24 AWG 20	190 Ω /km 70 Ω /km	157 nF/km 193 nF/km	249 nF/km 290 nF/km	0.60 mH/km 0.65 mH/km
RCCY033/034	-30 to +105°C	AWG 24 AWG 20	177 Ω /km 70 Ω /km	175 nF/km 145 nF/km	350 nF/km 290 nF/km	0.80 mH/km 0.70 mH/km
RCCY033/034 /KS1	-30 to +105°C	AWG 24 AWG 20	177 Ω /km 70 Ω /km	175 nF/km 145 nF/km	350 nF/km 290 nF/km	0.80 mH/km 0.70 mH/km

PLANNING AND INSTALLATION HINTS

Design Limits

It is the responsibility of the user to use the instrument within the given design limits. Erosion and corrosion influence the accuracy and may restrict the temperature / pressure limits. Therefore corrosion and erosion should be avoided.

Installation

The flowmeter can be installed vertically, horizontally or in any other position, as long as the measuring tubes are completely filled with the measured liquid during measurement.

Redundant Installation

If two flowmeters of the same size are installed in series mutual interference called cross talk may take place. Cross talk occurs due to the fact that both meters have the same resonance frequency. If serial installation is planned please contact your Yokogawa representative who can ensure that a frequency adjustment is made to one of the meters at the factory.

Sizing

The measuring range and accuracy are virtually independent of fluid conditions and size of the connecting pipe. Select a suitable nominal size from pressure loss calculation. Check whether the measuring range and accuracy at minimal flow fit the application. The calculations of the pressure loss are based on Newtonian fluids. For correct calculation of the pressure drop use the YOKOGAWA Sizing software.

Sanitary Applications

For sanitary applications select process connection S2, S4 or S8. The wetted surface will be $Ra \leq 1.6 \mu m$. However, if option /SFx is selected the surface roughness will be $Ra < 0.8 \mu m$ and with /SF2 a certificate with a 3- point roughness measurement certificate is delivered. The EHEDG certificate shows that ROTAMASS conforms to the EHEDG criteria regarding the capability to be cleaned by a CIP process. The evaluation does not include the process connections and seals.

Cavitation

To avoid cavitation keep the back pressure of the fluid sufficiently above the vapor pressure of the fluid. For low viscous fluids following condition should be fulfilled at the given temperature:

$$p_{back} > p_{vapor} + 0.7 \cdot \Delta p$$

With Δp = pressure loss (e.g. given by the Yokogawa sizing software)

Long Term Stability

To get stable deflection of the tubes by the coriolis forces the stiffness and therefore the wall thickness has to kept constant during measuring. With corrosion or erosion the meter factor is drifting with time and recalibration is necessary. Select the suitable resistant tube material for the process!

Recalibration Service

Yokogawa offers via its European Flow Centre (Rota Yokogawa, Germany) full recalibration service, if necessary with a certificate traceable to German national standards. Please contact your Yokogawa affiliate or directly Rota Yokogawa, Germany.

Heat Tracing and Insulation

Basically the detector can be insulated by the customer. To be sure not to overheat the connection box choose one of /Tx options (insulation or heat tracing from Yokogawa). For temperatures between 150°C and 230°C choose /MT option and remote installation. For low temperature fluids ask for special insulation. If Rotamass detector with /MT or /HT is not insulated, the accuracy specification can not be guaranteed. The converter should not be exceeded more than 50°C. Therefore never insulate the converter and keep the neck free from insulation too. Yokogawa will not take any liability regarding customer insulation.

Relations between Options /MT, /HT, /S2 and /Tx (/T1, /T2, /T3)

The meters with high temperature options (/MT, /HT) can be insulated either by the customer by using option /S2 (prolonged neck) or by the factory through options /Tx. The /Tx options already include the option /S2 so that the /S2 option can not be selected in case of the /Tx options. If the meter is not properly insulated by the customer, the accuracy specification can not be guaranteed.

Installation above 100°C Process Temperature

To provide enough cooling the instrument should be installed vertically or horizontally with the converter down. This is recommended for size RCCT/S36 and larger without /Tx option.

Installation below 0°C Process Temperature

The detector can be insulated to prevent ice capping either by the customer or by the manufacturer. Ask your Yokogawa representative for special insulation. If the customer wants to insulate by themselves a closed cell foam as insulation material is recommended to avoid water siphon. In this case option /S2 should be selected. For temperatures below -70°C option /LT is recommended (on request).

Zero Adjustment Function

Zero point can be adjusted either by setting the switches on display or with the HART communication or with status input when the fluid flow is stopped and the detector filled.

To ensure no flow conditions isolation valves should be installed. To achieve the specified accuracy a zero should be performed at process conditions (temp., pressure).

Pressure / Temperature Dependencies of Process Connections

See also process pressure limits in chapter "Normal operation conditions".

Rupture Disk

The rupture disk is used as annunciation method in the case of tube rupture (Dual Seal) preferable for high pressure gas service. Practically a tube rupture of ROTAMASS is not known to the manufacturer. For large sizes it cannot be expected that the full line pressure can be released via the rupture disk. If this is requested please contact Yokogawa for a special execution.

11. TECHNICAL DATA

Density Measurement

We offer 3 levels of density measurement. The standard adjustment (also /K4) delivers an accuracy up to 0.001 g/cm³, if the fluid density is around 1 kg/l. However, at elevated temperatures the density error may increase. For option /K4 the instrument is preheated ensuring long term stability. However, if high density stability is needed at high temperatures option /HT is recommended. Option /K6 includes preheating, a full calibration at 3 different densities, increased temperature measurement specification and individual adjustment of the fluid temperature dependency. For more information please see TI 01R04B04-05E "Density Measurement with ROTAMASS".

Overview density-/volume flow measurement:

Option	Accuracy	Certificate	Description	Application
Standard	± 0.0015 g/cm ³ to ± 0.008 g/cm ³	Standard (mass flow) factory calibration certificate	- Standard adjustment with water and air - Density constants given in mass flow certificate	- Process medium and environment are approximately at room temperature, the density range is 0.9 kg/l to 1.1 kg/l
Option /K4	± 0.001 g/cm ³	Standard (mass flow) factory calibration certificate	- Thermal treatment of the sensor and special hardware design - Standard adjustment with water and air - Density constants given in mass flow certificate	- Improved volume flow accuracy - Process medium up to 150°C, for higher temperature select option /HT - Density range is 0.9 kg/l to 1.1 kg/l
Option /K6	± 0.0005 g/cm ³	Separate factory density calibration certificate	- Thermal treatment of the sensor and special hardware design - Density calibration with 3 different liquids - Individual adjustment of the fluid temperature dependency	- Density and concentration measurement in addition to the mass flow: - Process medium up to 150°C, for higher temperature select option /HT - Density range 0.3 kg/l to 2 kg/l - Best volume flow accuracy

Explosion Proof Concept and Option /HP

The detector is intrinsically safe, the converter flame (explosion) proof (RCCF31) or intrinsically safe associated apparatus (RCCR31). The driving power from converter to detector is limited and protected by a barrier, which is part of the converter. The barrier is protecting the detector either for gas group IIC or IIB (option /HP). With option /HP the detector driving power is higher which is benefit to 2 phase flow. This is also true for non hazardous applications. Option /KF2 delivers one passive intrinsic safe current and one pulse output, however the converter is flame (explosion) proof.

Gas Measurement

For gas applications please choose the option /GA. Density reading below 0.3 kg/l is not possible. Volume flow is calculated by using the fix density value stored in „Reference density“. Based on the selection of the gas density, the following volume flow rates can be calculated; standard, reference, normal and operating. Besides, the corresponding volume flow rate units can be selected. Some functions are unavailable for gas measurement, including concentration measurement, empty pipe, slug or corrosion detection. Good and stress free installation is mandatory for a stable Zero. Attention to resonance phenomena has to be taken if gas compressors are used in the pipe. Flow noise has to be avoided.

Batch Process

The specified mass flow accuracy applies if the batch process is >1 minute. For shorter batch time (Δt in s) the accuracy decreases with the square root of $60/\Delta t$. For short batches the opening and closing times of the valves have to be greater than 2 seconds.

Concentration Measurement for Liquids

The Standard Concentration Measurement (option /CST) is suitable for concentration measurement of emulsions or suspensions, where the density of the solid is assumed to be fix. It can also be used for (mainly low concentration) solutions if the two fluids are not strongly interacting. The density change of the liquid components due to temperature can normally be described with a linear or quadratic function with very high accuracy within the desired measurement range. The coefficients of these function (linear and quadratic thermal expansion coefficients) must be either known or have to be determined prior to using this function. For interacting liquids the Advanced Concentration Measurement options should be used, these options can be ordered using the appropriate /Cxx concentration measurement option. For more information please see TI 01R04B04-04E-E "Concentration Measurement with ROTAMASS".

Table 11-8 : Pressure rating

Type of process connection ¹⁾		Process Temperature							
		RT ²⁾	50°C	100°C	150°C	200°C	250°C	300°C	350°C
A1	Flange acc. ASME B16.5 Class 150	15.9 bar	15.3 bar	13.2 bar	12.0 bar	11.0 bar	10.2 bar	9.7 bar	8.4 bar
A2	Flange acc. ASME B16.5 Class 300	41.4 bar	40.0 bar	34.5 bar	31.2 bar	28.7 bar	26.7 bar	25.2 bar	24.0 bar
A3	Flange acc. ASME B16.5 Class 600	82.7 bar	80.0 bar	69.9 bar	62.8 bar	58.3 bar	54.9 bar	52.1 bar	50.1 bar
A4	Flange acc. ASME B16.5 Class 900	124.1 bar	120.1 bar	104.4 bar	94.2 bar	87.5 bar	82.4 bar	78.2 bar	75.2 bar
A5	Flange acc. ASME B16.5 Class 1500	206.8 bar	200.1 bar	173.9 bar	157.0 bar	145.8 bar	137.3 bar	130.3 bar	125.4 bar
D2	Flange acc. EN 1092-1 PN 16	16 bar	15.6 bar	14.2 bar	12.8 bar	11.7 bar	10.9 bar	10.3 bar	9.9 bar
D4	Flange acc. EN 1092-1 PN 40	40 bar	39.1 bar	35.6 bar	32.0 bar	29.3 bar	27.2 bar	25.8 bar	24.7 bar
D5	Flange acc. EN 1092-1 PN 63	63 bar	61.6 bar	56.0 bar	50.4 bar	46.2 bar	42.8 bar	40.6 bar	38.9 bar
D6	Flange acc. EN 1092-1 PN 100	100 bar	97.7 bar	97.7 bar	80.0 bar	73.3 bar	68.0 bar	64.4 bar	61.8 bar
G9	Internal thread RCCS30...33)	See tube pressure, for option /DS max. pressure according A4, ASME class 900				----- -----			
T9	Internal thread NPT (RCCS30...33)	See tube pressure, for option /DS max. pressure according A4, ASME class 900				----- -----			
G9	Internal thread (RCCS34)	See tube pressure, for option /DS max. pressure according A4, ASME class 900							
T9	Internal thread NPT (RCCS34)	See tube pressure, for option /DS max. pressure according A4, ASME class 900							
		Process Temperature							
		up to 120°C				220°C		300°C	350°C
J1	Flange acc. JIS B 2220 10K	14 bar				12 bar		10 bar	-----
J2	Flange acc. JIS B 2220 20K	34 bar				31 bar		29 bar	26 bar
		Process Temperature							
		up to 140°C ¹⁾							
S2	Pipe connection up to DN 40	40 bar				¹⁾ under the restriction using suitable gasket materials			
	acc. DIN 11851 DN 50 to DN 100	25 bar							
	above DN 100	16 bar							
		Process Temperature							
		up to 150°C ²⁾							
S4	Clamp connection up to DN 50	16 bar				²⁾ under the restriction using suitable gasket materials			
	acc. DIN 32676 above DN 50	10 bar							
S8	Clamp acc. Mini-Clamp up to 1/2''	16 bar							
	Clamp acc. Tri-Clamp up to 2'' above 2''	16 bar 10 bar							

¹⁾ all process connections are made of material 1.4404 / 1.4435 (equivalent to group 2.3 material AISI 316L acc. ASME B16.5)

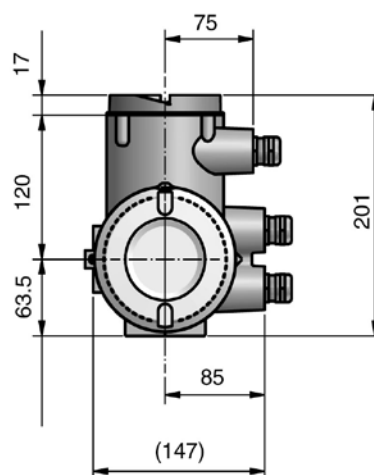
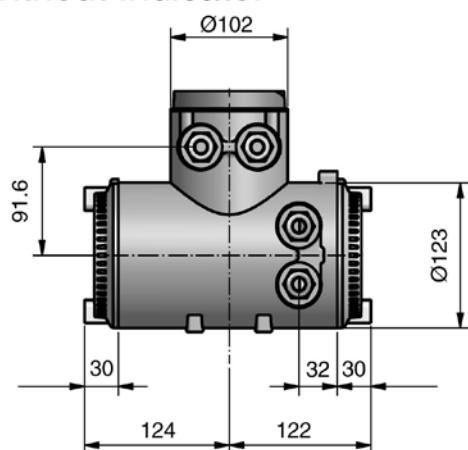
²⁾ RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C

¹⁾ all process connections are made of material 1.4404 / 1.4435 (equivalent to group 2.3 material AISI 316L acc. ASME B16.5)

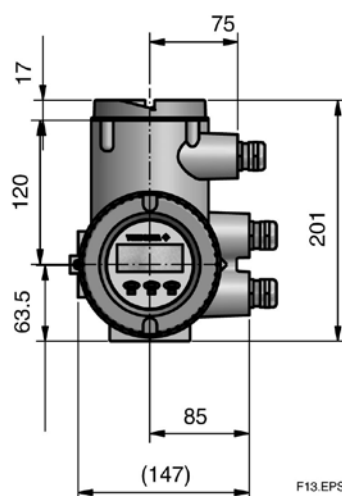
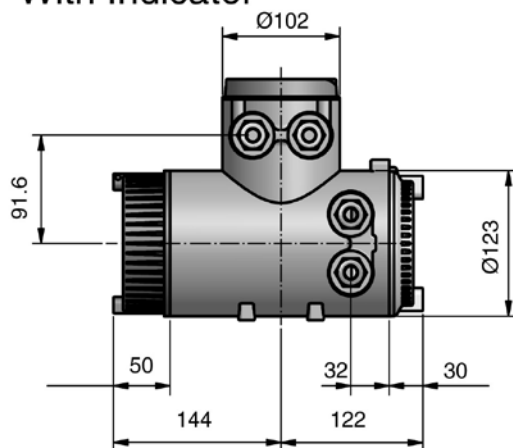
²⁾ RT = Room Temperature; EN1092: -10°C to 50°C; ASME B16.5: -29°C to 38°C

Remote field-mount Converter RCCF31

Without Indicator



With Indicator

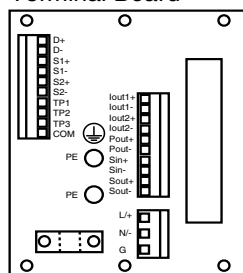


Weight: Standard type: 4 kg / Explosion proof type: 4.5 kg

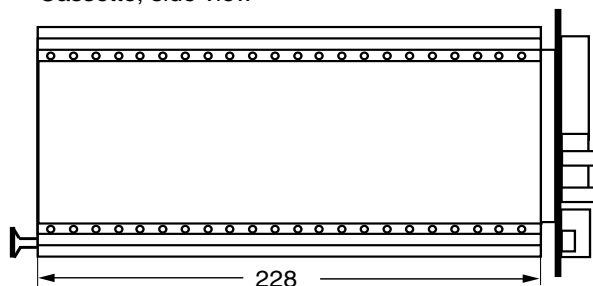
F13.EPS

Remote rack-mount Converter RCCR31

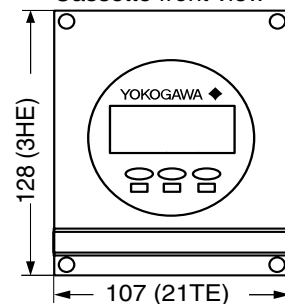
Terminal Board



Cassette, side view



Cassette front view

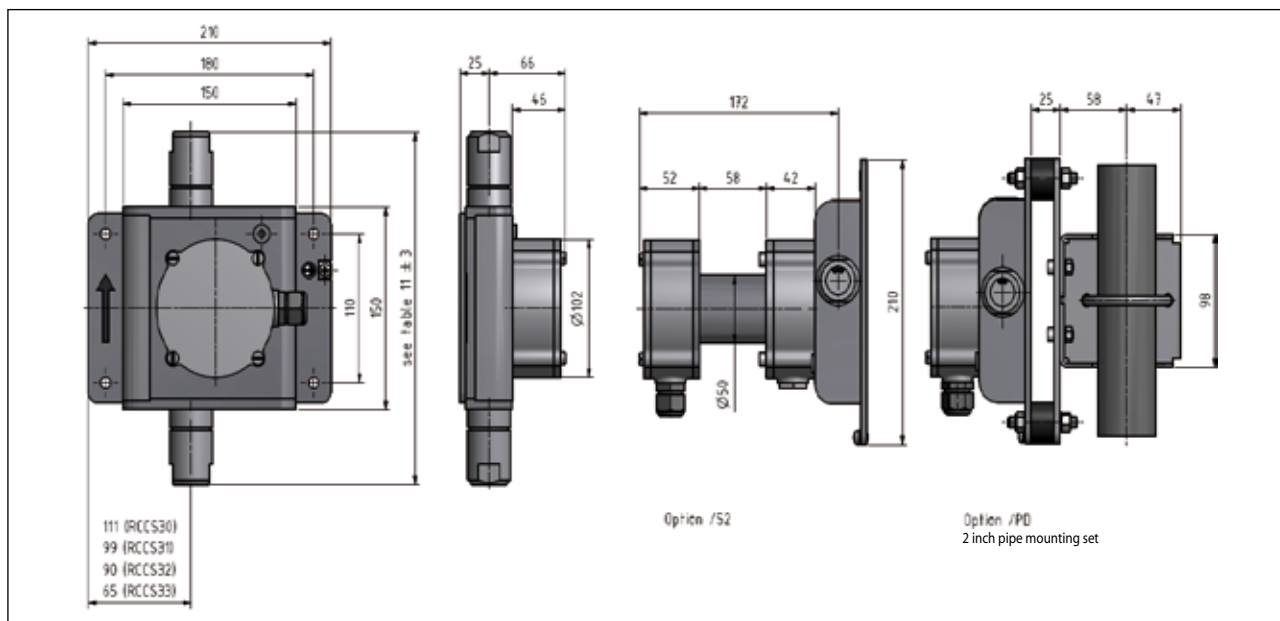


Dimensions in mm
19-inch rack, European standard DIN 41494
Weight: 1.5 kg

F17.EPS

11. TECHNICAL DATA

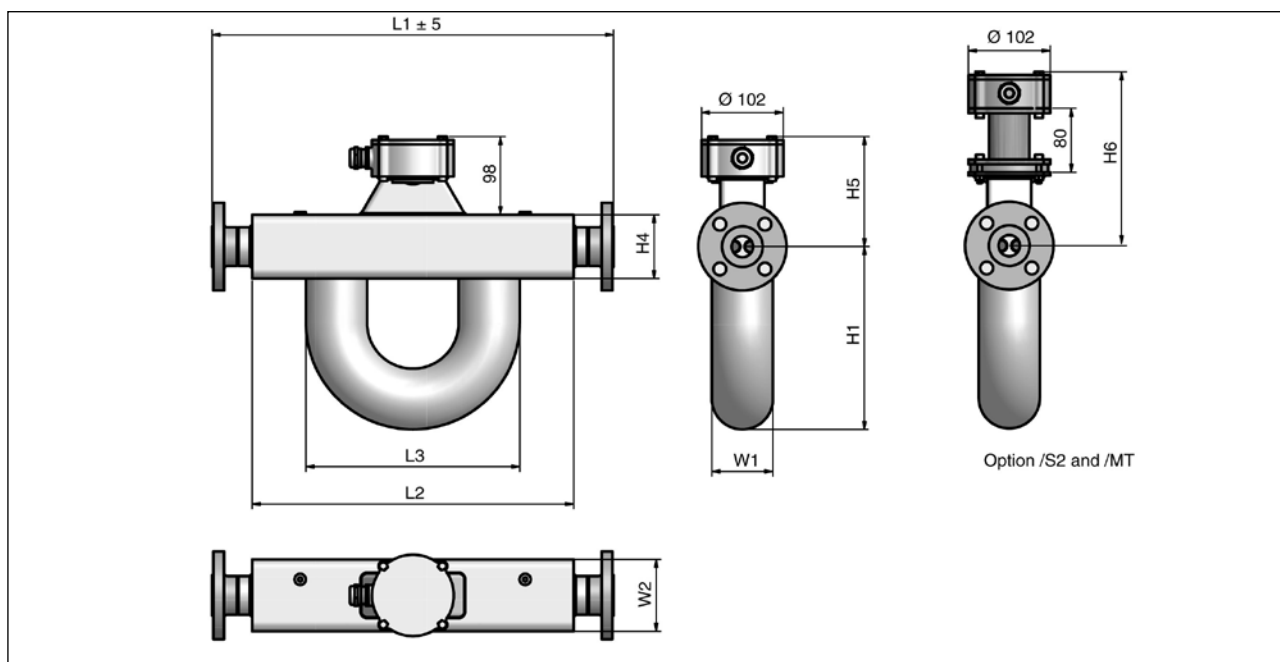
Remote Detector RCCS30 - 33



Dimensions in mm.

Weight (without flanges): 3.5kg

Remote Detector RCCS34 - 39/IR

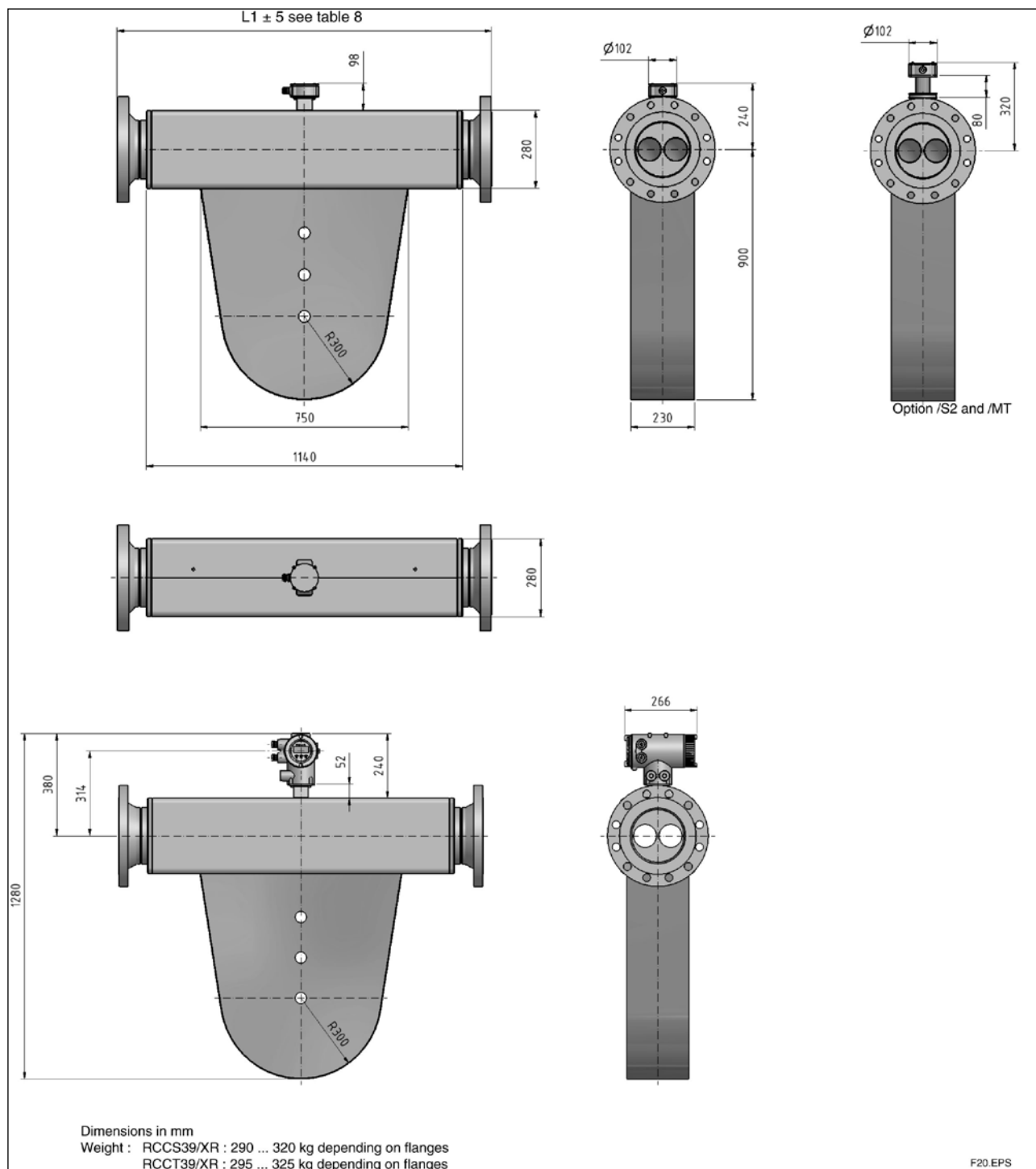


Note: The flange dimensions depend on size and pressure rating of the flange.

Model		L1	L2	L3	H1	W1	W2	H4	H5	H6	Weight
RCCS34	[mm]	see table 10	272	212	180	60	80	80	138	218	9.5 kg
RCCS36	[mm]	see table 10	400	266	233	76	90	80	138	218	13 kg
RCCS38	[mm]	see table 10	490	267	274	89	110	100	148	228	22 kg
RCCS39	[mm]	see table 10	850	379	370	129	160	135	166	246	60 kg
RCCS39/IR	[mm]	see table 10	870	455	453	155	200	200	198	278	88 kg
RCCS39/XR	[mm]	see separate figure on page 11-11									

Dimensions in [mm]. Weights with smallest flanges.

Remote Detector RCCS39/XR / Integral Type RCCT39/XR



11. TECHNICAL DATA

Remote Detector RCCS30 - 33 with Option /Tx (Insulation / Heating)

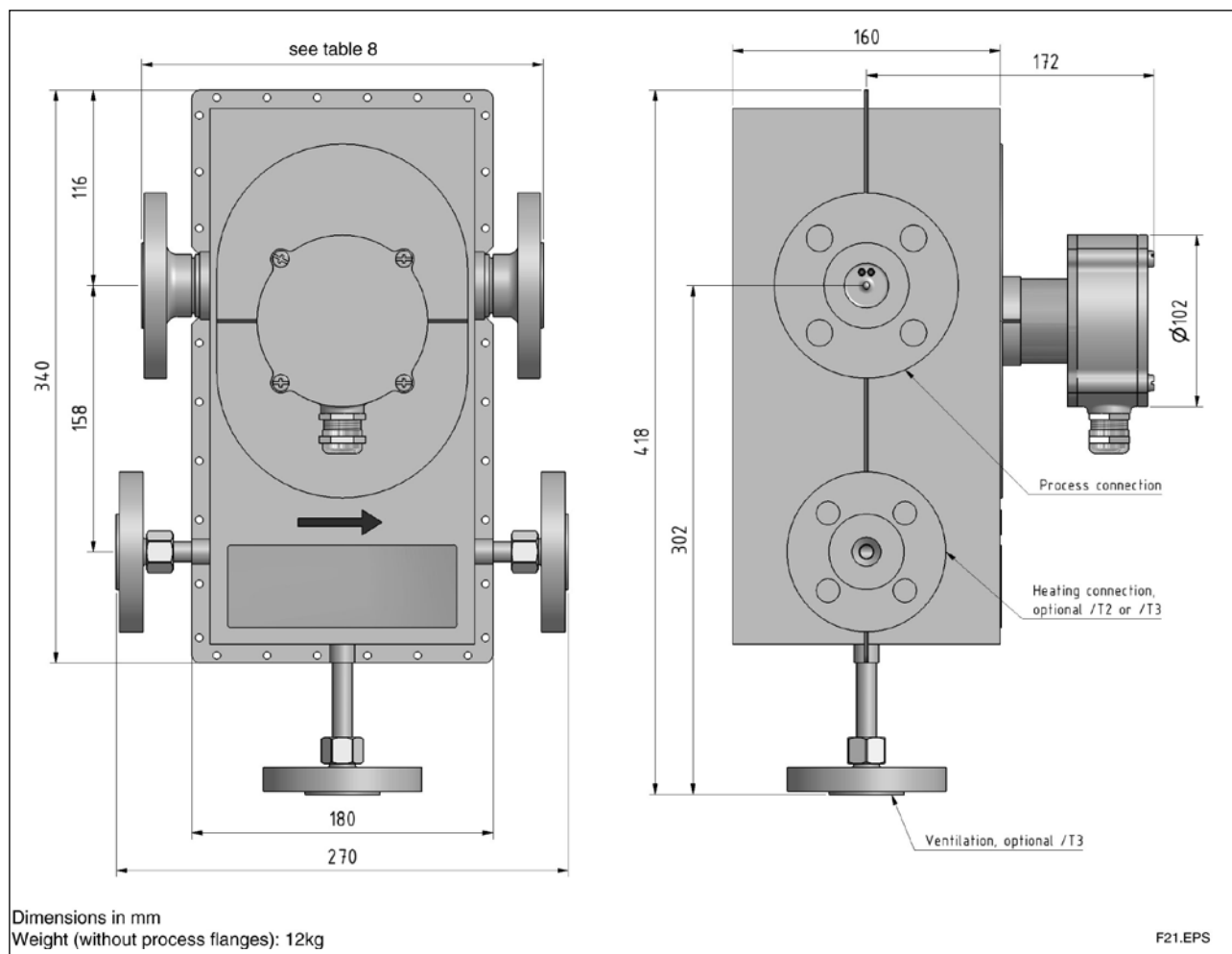
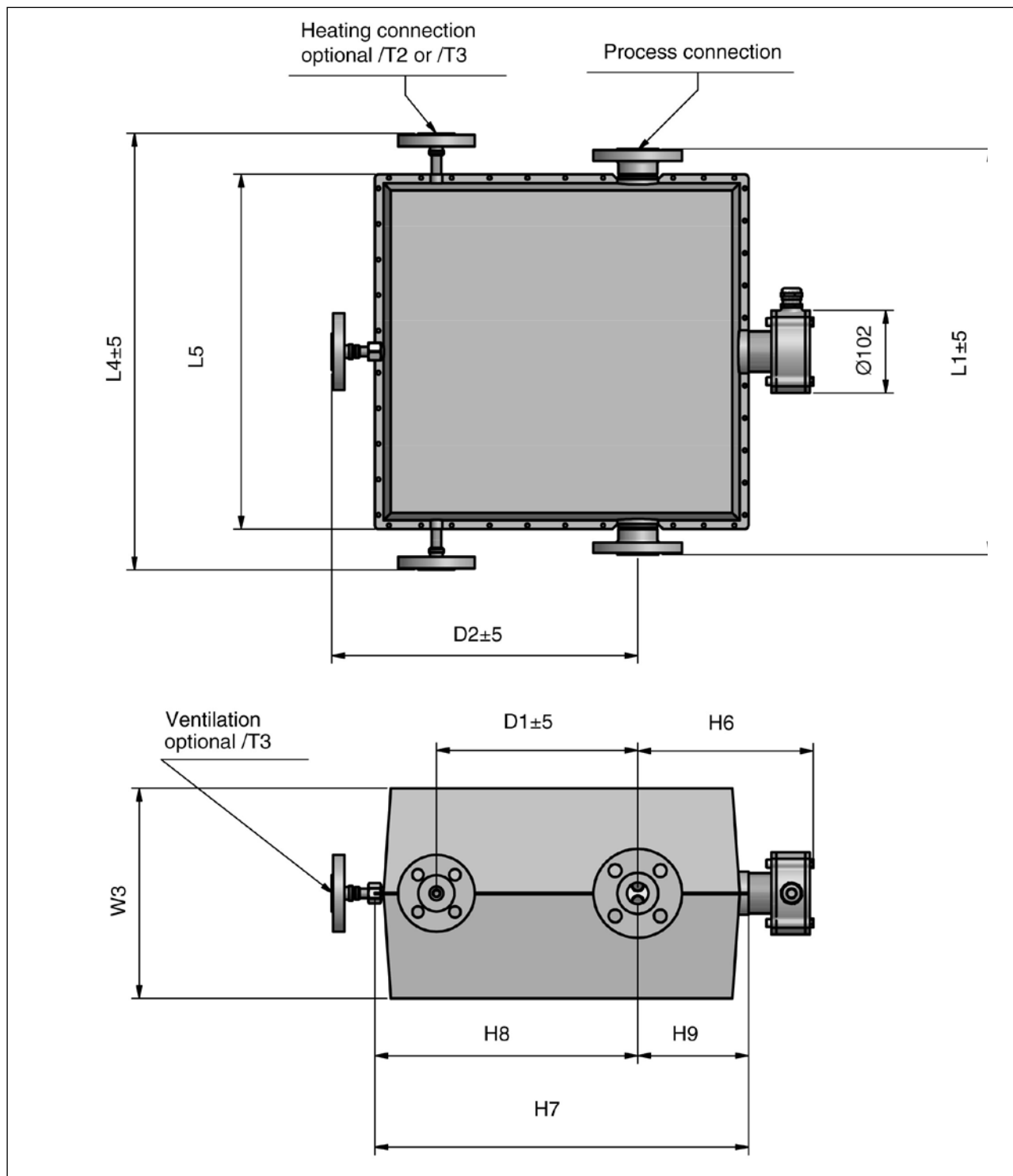


Table 11-9: Heat tracing connection types depending on process connection type

Process connection	Standard heating connection *)
Ax	ASME ½" - 150
Dx	EN DN 15 PN 40
Jx	JIS 10K DN15
S2 ; S4	EN DN 15 PN 40
S8	ASME ½" - 150
G9	EN DN 15 PN 40
T9	ASME ½" - 150

*) others on request

Remote Detector RCCS34 - 39/IR with Option /Tx (Insulation / Heating)



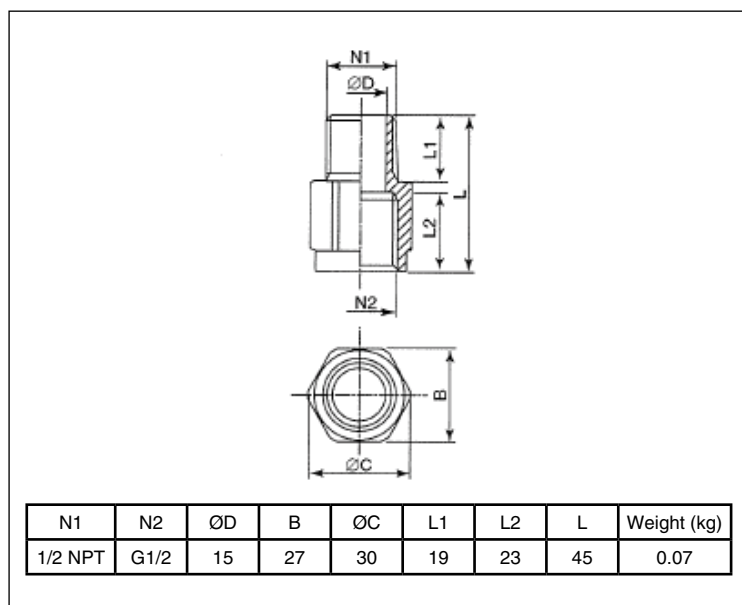
Note: The flange dimensions depend on size and pressure rating of the flange.

Model		L1	L4	L5	D1	D2	H6	H7	H8	H9	W3	Weight
RCCS34	[mm]	see table 10	420	310	200	330	218	411	273	138	240	18 kg
RCCS36	[mm]	see table 10	540	439	250	380	218	464	326	138	260	25 kg
RCCS38	[mm]	see table 10	640	530	250	430	228	524	376	148	260	37 kg
RCCS39	[mm]	see table 10	1000	884	350	580	246	684	520	165	304	95 kg
RCCS39/IR	[mm]	see table 10	1040	932	350	590	278	730	530	200	343	125 kg

Dimensions in [mm]. Weights with smallest flanges including insulation cover and heat tracing.
Standard heating connection according table 11-9.

11. TECHNICAL DATA

Adapter 1/2" NPT - G1/2 (option /AD2)



11.3 Model, Suffix and Option Codes

Integral type RCCT3, Modell- and Suffix- Code :

Model	Suffix Code	Description	Restrictions
RCCT34 RCCT36 RCCT38 RCCT39 RCCT39/IR RCCT39/XR		Nominal Value : 3 t/h = 50 kg/min Nominal Value : 10 t/h = 170 kg/min Nominal Value : 32 t/h = 533 kg/min Nominal Value : 100 t/h = 1670 kg/min Nominal Value : 250 t/h = 4170 kg/min Nominal Value : 500 t/h = 8340 kg/min	only with /HP
Power supply	-A -D	90 - 264 V AC 24 V DC	
Indicator direction	H1 H2 V0 N0	Detector installation horizontal, tubes down Detector installation horizontal, tubes up Detector installation vertical Without indicator	recom. for liquid service recom. for gas service /GA
Cable conduit connection	M A	M20 x 1, female thread with cable glands ANSI 1/2" NPT, female thread without cable glands	mandatory with /FF1, /FF3
Process connection size ¹⁾	23 01 02 04 05 06 08 10 12 15 20	3/4" DN 15, 1/2" DN 25, 1" DN 40, 1 1/2" DN 50, 2" DN 65, 2 1/2" DN 80, 3" DN 100, 4" DN 125, 5" DN 150, 6" DN 200, 8"	see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10
Process connection rating and style ¹⁾	A1 A2 A3 A4 A5 D2 D4 D5 D6 J1 J2 S2 S4 S8 G9 T9	ASME flange class 150, process connection dim. + facing acc. ASME B16.5 ASME flange class 300, process connection dim. + facing acc. ASME B16.5 ASME flange class 600, process connection dim. + facing acc. ASME B16.5 ASME flange class 900, process connection dim. + facing acc. ASME B16.5 ASME flange class 1500, process connection dim. + facing acc. ASME B16.5 EN flange PN 16, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 40, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 63, process connection dim. + facing acc. EN 1092-1 Form B2 EN flange PN 100, process connection dim. + facing acc. EN 1092-1 Form B2 JIS flange 10K, JIS B 2220 JIS flange 20K, JIS B 2220 Thread acc. DIN 11851 Clamp, process connection dimensions acc. DIN 32676 Clamp, process connection dim. acc. Tri-Clover (Tri-Clamp) and 1/2" Mini Clamp G, female thread NPT, female thread	see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10
Material of wetted parts ¹⁾	SL HC	Stainless steel 316L (1.4404) Hastelloy C-22 (2.4602)	only RCCT34 to 39/IR

¹⁾ see selection table „Process connection and materials“ (table 11-10)

Integral type RCCT3, Option- Code :

Options	Option code	Description	Restrictions
Hazardous Area Approvals	/KF1 /KF2 /FF1 /FF2 /EF1 /EF2 /UF1 /UF2	ATEX Flame proof converter + Intrinsic safe detector ATEX Flame proof converter + Intrinsic safe detector + Intrinsic safe outputs FM approval for USA+Canada, Flame proof converter + Intrinsic safe detector + 2 active analog outputs + 2 passive pulse outputs + 1 status input FM approval for USA+Canada, Flame proof converter + Intrinsic safe detector + 1 passive analog output + 1 passive pulse output IECEX Flame proof converter + Intrinsic safe detector IECEX Flame proof converter + Intrinsic safe detector + Intrinsic safe outputs INMETRO Flame proof converter + Intrinsic safe detector INMETRO Flame proof converter + Intrinsic safe detector + Intrinsic safe outputs	with /HP for gas group IIB with /HP for gas group IIB only with cable conduit 'A'; with /HP not for groups A and B only with cable conduit 'A'; with /HP not for groups A and B; not with /HP for gas group IIB with /HP for gas group IIB with /HP for gas group IIB with /HP for gas group IIB
Custody Transfer Measurement acc. OIML R 117-1	/Q01	European MID Approval (fluids other than water) (refer to GS 01R04B07-00E)	
GOST Approval	/QR1 /QR2 /QR3	Russian GOST approval Kazakh GOST approval Uzbekistan GOST approval	see chapter 9.5 see chapter 9.5; not for RCCT39/XR; not with /HP see chapter 9.5; not for RCCT39/XR; not with /HP
Dual Seal Approval	/DS /RD	Dual Seal approval (conform with ANSI/ISA-12.27.01) Rupture disk	only with /FF1; not with process connection A5; not wit RCCT39/XR, preferable with /GA, mandatory if /DS+/GA is selected

¹⁾ This is a flame proof device, not an intrinsic safe device!

11. TECHNICAL DATA

Integral type RCCT3, Option- Code (continued) :

Options	Option code	Description	Restrictions
High Driving Power	/HP	High Driving Power	not for RCCT34, recommended for RCCT36 to 39, strongly recommended for RCCT39/IR, mandatory for RCCT39/XR
Fieldbus Communication	/FB	Digital communication Foundation Fieldbus protocol (refer to GS 01R04B05-00E)	
Active Pulse Output	/AP	One active pulse output	not with /KF2, /EF2, /UF2, /NM
NAMUR Switch	/NM	One pulse output acc. to EN 60947-5-6 (NAMUR)	not with /AP
Analog Alarm Levels	/NA	Analog output alarm levels 2.4 mA or 21.6 mA (Standard is acc. to NAMUR rec. 43)	
Tag Number	/BG	With customer specified tag number on name plate	max. 16 digits
HART Tag Number (Software Tag)	/BT1	With customer specified tag number for HART communication in converter	8 digits for tag, 22 digits for long tag
Flange Facing	/DN /RJ	Flange with safety grooves acc. to EN 1092-1 form D Ring Type Joint Flanges	only for D2 to D6; not HC only for A3, A4, A5; not HC
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	to be conform with ANSI/ISA-12.27.01 select /RD
Special Calibration	/K2 ²⁾	Custom 5 pts mass-/volume-flow calibration using water with factory certificate (traceable to German national standards)	only RCCT34 to 39; not with /GA
	/K4	Density adjustment + thermal treatment; (accuracy: 0.001 g/cm ³)	
	/K5 ²⁾	Custom 10 pts mass-/volume-flow calibration using water with DKD certificate (according EN-17025:2005)	
	/K6	Density calibration with 3 different fluids incl. individual temperature compensation with certificate (accuracy: 0.0005 g/cm ³)	
Certificates	/P2	Certificate of compliance with the order acc. to EN 1024:2004 -2.1	only for butt weld between process connection and flow divider; not for material HC
	/P3	As /P2 + Test report acc. to EN 1024: 2004 -2.2 (QIC)	
	/P6	Material certificate acc. to EN 1024: 2004 -3.1	
	/P8	Pressure test report measuring system	
	/H1	Oil and fat free for wetted surface acc. to ASTM G93-03 level C	
	/WP	WPS acc. DIN EN ISO 15609-1 (Welding Procedure Specification) WPQR acc. DIN EN ISO 15614-1 (Welder Performance Qualification Record) WQC acc. DIN EN 287-1 (Welder Qualification Certificate)	
Sanitary Type	/SF1	Surface roughness Ra = 0.8 µm	not RCCT39/XR; only process connections S2, S4, S8; see also restrictions in table 11-10
	/SF2	As /SF1 + Test report roughness of wetted parts	not with process connection S2 not with process connection S2
	/SA	As /SF2 + 3A- declaration of conformity and 3A- mark	
	/SE	As /SF2 + EHEDG certificate	
Customer Presetting	/PS	Presetting sheet with customer data	has to be issued with the order
Housing Pressure Test	/J1	Rupture pressure proof test and certificate: 60 bar (RCCT34, RCCT36), 40 bar (RCCT38), 10 bar (RCCT39, RCCT39/IR)	not for RCCT39/XR
X-Ray Examination	/RT	X-ray examination of flange welding	RCCT34 with /K4 or /K6 only one-sided
PMI Examination	/PM6	PAMI test (6 test points: process connection inlet + outlet, measuring tubes, flow divider inlet + outlet) ³⁾	
Dye Penetration Test	/PT	Dye penetration test of flange welding	
Epoxy Coating	/X1	Epoxy coating of converter housing	
Concentration Measurement ⁴⁾	/CST	Standard concentration measurement	
	/Cxx	Advanced concentration measurement, details see table „Advanced Concentration Measurement Options“	
Delivery to Japan	/PJ	For meters which are delivered to Japan, with SI-unit preset	
Adapter	/AD2	2 pcs ANSI 1/2" NPT / G1/2 adapter	only with cable conduit 'A'
Instruction Manuals	/IE _n	Quantity of instruction manuals in English	n = 1 to 3 selectable ⁵⁾
	/ID _n	Quantity of instruction manuals in German	n = 1 to 3 selectable ⁵⁾
	/IF _n	Quantity of instruction manuals in French	n = 1 to 3 selectable ⁵⁾
Quick Delivery	/QD	Delivery within 24 hours from factory	not RCCT39/IR, RCCT39/XR, not with process connection size 23, 12, only with process connection rating A1, A2, D4, only material SL, only for options /KF1, /FF1, /EF1, /UF1, /HP, /AP, /NM, /NA, /BG, /P2, /P3, /P8, /CST, /Cxx, /IE _n , /ID _n , /IF _n
Special order	/Z	Special design must be specification an extra sheet	

²⁾ Calibration order sheet must be delivered with the order. This is available on the Flow Center Page at Coriolis/RCCx3/Technical Information.

³⁾ Measuring tube PAMI test is performed per delivery batch.

⁴⁾ For detailed information please see TI 01R04B04-04E-E. Concentration measurement is recommended with option /K6.

⁵⁾ If no instruction manual is selected, only a CD with instruction manuals is shipped with the instrument. More than 3 manuals of one language on request.

Remote detector RCCS3, Model- and Suffix- Code :

Model	Suffix Code	Description	Restrictions
RCCS30 RCCS31 RCCS32 RCCS33 RCCS34 RCCS36 RCCS38 RCCS39 RCCS39/IR RCCS39/XR		Nominal Value : 0.045 t/h = 0.75 kg/min Nominal Value : 0.17 t/h = 2.8 kg/min Nominal Value : 0.37 t/h = 6.2 kg/min Nominal Value : 0.9 t/h = 15 kg/min Nominal Value : 3 t/h = 50 kg/min Nominal Value : 10 t/h = 170 kg/min Nominal Value : 32 t/h = 533 kg/min Nominal Value : 100 t/h = 1670 kg/min Nominal Value : 250 t/h = 4170 kg/min Nominal Value : 500 t/h = 8340 kg/min	select affiliated RCCF31 or RCCR31 with /HP
Cable conduit connection	-M -A	M20 x 1, female thread with cable glands ANSI ½" NPT, female thread only with cable gland for detector connection	mandatory with /FS1
Process connection size ¹⁾	41 01 23 02 04 05 06 08 10 12 15 20	¼" DN 15, ½" ¾" DN 25, 1" DN 40, 1½" DN 50, 2" DN 65, 2½" DN 80, 3" DN 100, 4" DN 125, 5" DN 150, 6" DN 200, 8"	see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10
Process connection rating and style ¹⁾	A1 A2 A3 A4 A5 D2 D4 D5 D6 J1 J2 S2 S4 S8 G9 T9	ASME flange class 150, process connection dim. + facing acc. ASME B16.5 ASME flange class 300, process connection dim. + facing acc. ASME B16.5 ASME flange class 600, process connection dim. + facing acc. ASME B16.5 ASME flange class 900, process connection dim. + facing acc. ASME B16.5 ASME flange class 1500, process connection dim. + facing acc. ASME B16.5 EN flange PN 16, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 40, process connection dim. + facing acc. EN 1092-1 Form B1 EN flange PN 63, process connection dim. + facing acc. EN 1092-1 Form B2 EN flange PN 100, process connection dim. + facing acc. EN 1092-1 Form B2 JIS flange 10K, JIS B 2220 JIS flange 20K, JIS B 2220 Thread acc. DIN 11851 Clamp, process connection dimensions acc. DIN 32676 Clamp, process connection dim. acc. Tri-Clover (Tri-Clamp) and ½" Mini Clamp G, female thread NPT, female thread	see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10 see table 11-10
Material of wetted parts ¹⁾	SH SL HC	316L (1.4404) and Hastelloy C-22 (2.4602) for tube Stainless steel 316L (1.4404) Hastelloy C-22 (2.4602)	only RCCS30 to 33 only RCCS34 to 39/XR only RCCS34 to 39/IR

¹⁾ see selection table „Process connection and materials“ (table 11-10)

11. TECHNICAL DATA

Remote detector RCCS3, Option- Code :

Options	Option code	Description	Restrictions
Hazardous Area Approvals ¹⁾	/KS1 /FS1 /ES1 /US1	ATEX intrinsically safe approval FM intrinsically safe approval for USA + Canada IECEX intrinsically safe approval INMETRO intrinsically safe approval for Brazil	only with cable conduit 'A'
Custody Transfer Measurement acc. OIML R 117-1	/QO1	European MID Approval (fluids other than water) (refer to GS 01R04B07-00E)	
GOST Approval ¹⁾	/QR1 /QR2 /QR3	Russian GOST approval Kazakh GOST approval Uzbekistan GOST approval	see chapter 9.5; not with /LT see chapter 9.5; not for RCCS39/XR; not with /LT see chapter 9.5; not for RCCS39/XR; not with /LT
Dual Seal Approval	/DS /RD	Dual Seal approval (conform with ANSI/ISA-12.27.01) Rupture disk	only RCCS34 to 39/XR; only with /FS1; not with process connection A5 only RCCS34 to 39/IR, preferable with /GA, not with /Tx, mandatory if /DS + /GA is selected
Tag Number	/BG	With customer specified tag number on name plate	max. 16 digits
Flange Facing	/DN /RJ	Flange with safety grooves acc. to EN 1092-1 form D Ring Type Joint Flanges	only for D2 to D6; not HC only for A3, A4, A5; not HC
Gas Measurement	/GA	Gas measurement, special factory adjustments and settings	select affiliated RCCF31 or RCCR31 with /GA; to be conform with ANSI/ISA-12.27.01 select /RD
Low temperature version	/LT	-200°C < T _{medium} < 150°C	not RCCS30 to 33; not with /KS1, /FS1, /ES1, /US1, /MT, /HT, /T1, /T2, /T3, /QR1, /QR2, /QR3
Extended temperature range	/MT	-70°C < T _{medium} < 230°C	not RCCS30 to 33; always with /S2 or /Tx; remote cable RCCY033/034 recommended
High temperature version	/HT	T _{medium} up to 350°C	only with /Tx or /S2 (customer insulation required); only RCCS34 to 39/IR; remote cable RCCY033/034 recommended
Special Calibration	/K2 ²⁾ /K4 /K5 ²⁾ /K6	Custom 5 pts mass-/volume-flow calibration using water with factory certificate (traceable to German national standards) Density adjustment + thermal treatment; (accuracy: 0.001 g/cm³) Custom 10 pts mass-/volume-flow calibration using water with DKD certificate (according EN-17025:2005) Density calibration with 3 different fluids incl. individual temperature compensation with certificate (accuracy: 0.0005 g/cm³)	only RCCS31 to 39; not with /GA only RCCS32 to 39; not with /GA; only available if converter is also ordered
Certificates	/P2 /P3 /P6 /P8 /H1 /WP	Certificate of compliance with the order acc. to EN 1024:2004 -2.1 As /P2 + Test report acc to EN 1024: 2004 -2.2 (QIC) Material certificate acc to EN 1024: 2004 -3.1 Pressure test report measuring system Oil and fat free for wetted surface acc. to ASTM G93-03 level C WPS acc. DIN EN ISO 15609-1 (Welding Procedure Specification) WPQR acc. DIN EN ISO 15614-1 (Welder Performance Qualification Record) WQC acc. DIN EN 287-1 (Welder Qualification Certificate)	only for butt weld between process connection and flow divider; not for HC
Sanitary Type	/SF1 /SF2 /SA /SE	Surface roughness Ra = 0.8 µm As /SF1 + Test report roughness of wetted parts As /SF2 + 3A- declaration of conformity and 3A- mark As /SF2 + EHEDG- certificate	only RCCS34 to 39/IR; only process connections S2, S4, S8; see also restrictions in table 11-10 not with process connection S2 not with process connection S2
Mounting set	/PD	2 inch pipe mounting set	only RCCS30 to 33; not with /Tx; recommended for RCCS30
Housing Pressure Test	/J1	Rupture pressure proof test and certificate: 60 bar (RCCS34, RCCS36), 40 bar (RCCS38), 10 bar (RCCS39, RCCS39/IR)	not for RCCS30 to 33 + RCCS39/XR
Customer insulation / Heating	/S2	Terminal box on extension for high or low process temperature	not with /T1 ... /T3
Factory Insulating / Heating	/T1 /T2 /T3	Insulation Insulation + Heat carrier heating Insulation + Heat carrier heating with ventilation (purge)	not for RCCS39/XR not for RCCS39/XR not for RCCS39/XR
X-Ray Examination	/RT	X-ray examination of flange welding	RCCS30 to 33 and RCCS34 with /K4, /K6 or /LT only one-sided
PMI Examination	/PM4 /PM6	PAMI test (4 test points: process connection inlet + outlet, flow divider inlet + outlet) ³⁾ PAMI test (6 test points: process connection inlet + outlet, measuring tubes, flow divider inlet + outlet) ³⁾	only RCCS30 to 33 not RCCS30 to 33
Dye Penetration Test	/PT	Dye penetration test of flange welding	
Stainless steel cable gland	/BS	Cable gland stainless steel	
Delivery to Japan	/PJ	For meters which are delivered to Japan	
Quick Delivery	/QD	Delivery within 24 hours from factory	only RCCS34 to 39 not with process connection size 23, 12, only with process connection rating A1, A2, D4, only material SL, only for options /KS1, /FS1, /ES1, /US1, /BG, /P2, /P3, /P8
Special order	/Z	Special design must be specification an extra sheet	

¹⁾ Select affiliated converter RCCF31/RCCR31 with the same approval type (e.g. ATEX).

²⁾ Calibration order sheet must be delivered with the order. This is available on the Flow Center Page at Coriolis/RCCx3/Technical Information.

³⁾ Measuring tube PAMI test is performed per delivery batch.

Remote field-mount converter RCCF31, Model-, Suffix- and Option- Code :

Model	Suffix Code	Option Code	Description	Restrictions
RCCF31			Remote field-mount converter to be connected to RCCS3; when ordered without detector combination option /NC must be selected	
Power supply	-A -D		90 - 264 V AC 24 V DC	
Indicator direction	H2 N0		With indicator Without indicator	
Cable conduit connection	M A		M20 x 1, female thread with cable glands ANSI 1/2" NPT, female thread, only cable gland for detector connection	mandatory with /FF1, /FF3
Hazardous Area Approvals ¹⁾	/KF1 /KF2 /FF1 /FF2 /EF1 /EF2 /UF1 /UF2		ATEX Flame proof converter + Intrinsic safe detector output ATEX Flame proof converter + Intrinsic safe detector output + Intrinsic safe outputs FM approval for USA+Canada, Flame proof converter + Intrinsic safe detector output + 2 active analog outputs + 2 passive pulse outputs + 1 status input FM approval for USA+Canada, Flame proof converter + Intrinsic safe detector output + 1 passive analog output + 1 passive pulse output IECEX Flame proof converter + Intrinsic safe detector output IECEX Flame proof converter + Intrinsic safe detector output + Intrinsic safe outputs INMETRO Flame proof converter + Intrinsic safe detector output INMETRO Flame proof converter + Intrinsic safe detector output + Intrinsic safe outputs	with /HP for gas group IIB with /HP for gas group IIB only with cable conduit 'A'; with /HP not for groups A and B only with cable conduit 'A'; with /HP not for groups A and B with /HP for gas group IIB with /HP for gas group IIB with /HP for gas group IIB with /HP for gas group IIB
Custody Transfer Measurement acc. OIML R 117-1	/Q01		European MID Approval (fluids other than water) (refer to GS 01R04B07-00E)	
GOST Approval ¹⁾	/QR1 /QR2 /QR3		Russian GOST approval Kazakh GOST approval Uzbekistan GOST approval	see chapter 9.5 see chapter 9.5; not with /HP see chapter 9.5; not with /HP
Fieldbus Communication	/FB		Digital communication (Foundation Fieldbus protocol refer to GS 01R04B05-00E)	
High Driving Power	/HP		High Driving Power	not for combination with RCCS30 to 34, recommended for combination with RCCS36 to 39, strongly recommended for combination with RCCS39/IR, mandatory for combination with RCCS39/XR
Active Pulse Output	/AP		One active pulse output	not with /KF2, /EF2, /UF2, /NM
NAMUR Switch	/NM		One pulse output acc. EN 60947-5-6 (NAMUR)	not with /AP
Analog Alarm Levels	/NA		Analog output alarm levels 2.4 mA or 21.6 mA (Standard is acc. NAMUR rec. 43)	
Tag Number	/BG		With customer specified tag number on name plate	max. 16 digits
HART Tag Number (Software Tag)	/BT1		With customer specified tag number for HART communication in converter	8 digits for tag, 22 digits for long tag
Gas Measurement	/GA		Gas measurement, special factory adjustments and settings	select affiliated RCCS3 with /GA
Combination with RCCS39/XR	/XR		Special converter adjustment with RCCS39/XR	mandatory for combination with RCCS39/XR
No Combination	/NC		No combination with detector	
Customer Presetting	/PS		Presetting sheet with customer data	has to be issued with the order
Epoxy Coating	/X1		Epoxy coating of converter housing	
Delivery to Japan	/PJ		For meters which are delivered to Japan with SI-unit preset	
Adapter	/AD2		2 pcs ANSI 1/2" NPT / G1/2 adapter	only with cable conduit 'A'
Concentration Measurement ²⁾	/CST /Cxx		Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options“	
Instruction Manuals	/IE n /ID n /IF n		Quantity of instruction manuals in English Quantity of instruction manuals in German Quantity of instruction manuals in French	n = 1 to 3 selectable ³⁾ n = 1 to 3 selectable ³⁾ n = 1 to 3 selectable ³⁾
Quick Delivery	/QD		Delivery within 24 hours from factory	not with /KF2, /EF2, /FF2, /UF2, /PJ, /AD, /FB, /GA, /QR1, /QR2, /QR3, /PS, /X1
Special order	/Z		Special design must be specification an extra sheet	

¹⁾ Select affiliated RCCS3 with the same approval type (e.g. /KFx with /KS1).

²⁾ For detailed information please see TI 01R04B04-04E-E. Option /K6 of RCCS3 is recommended with concentration measurement.

³⁾ If no instruction manual is selected, only a CD with instruction manuals is shipped with the instrument. More than 3 manuals of one language on request.

11. TECHNICAL DATA

Remote rack-mount converter RCCR31, Model-, Suffix- and Option- Code :

Model	Suffix Code	Option Code	Description	Restrictions
RCCR31			Remote converter for 19" rack mounting to be connected to RCCS3	
Power supply	-A -D		90 - 264 V AC 24 V DC	
Hazardous Area Approvals ¹⁾		/KS1 /FS1 /ES1 /US1	ATEX associated apparatus for intrinsic safe detector connection for gas group IIC FM associated apparatus for intrinsic safe detector output IECEX associated apparatus for intrinsic safe detector output for gas group IIC INMETRO associated apparatus for intrinsic safe detector output for gas group IIC	with /HP for gas group IIB with /HP not for gas groups A and B with /HP for gas group IIB with /HP for gas group IIB
GOST Approval ¹⁾		/QR1	Russian GOST approval	see chapter 9.5
High Driving Power		/HP	High Driving Power	not for combination with RCCS30 to 34, recommended for combination with RCCS36 to 39, strongly recommended for combination with RCCS39/IR, mandatory for combination with RCCS39/XR
Active Pulse Output		/AP	One active pulse output	not with /NM
NAMUR Switch		/NM	One pulse output acc. EN 60947-5-6 (NAMUR)	not with /AP
Analog Alarm Levels		/NA	Analog output alarm levels 2.4 mA or 21.6 mA (Standard is acc. NAMUR rec. 43)	
Tag Number		/BG	With customer specified tag number on name plate	max. 16 digits
HART Tag Number (Software Tag)		/BT1	With customer specified tag number for HART communication in converter	8 digits for tag, 22 digits for long tag
Gas Measurement		/GA	Gas measurement, special factory adjustments and settings	select affiliated RCCS3 with /GA
Combination with RCCS39/XR		/XR	Special converter adjustment with RCCS39/XR	mandatory for combination with RCCS39/XR
No Combination		/NC	No combination with detector	
Customer Presetting		/PS	Presetting sheet with customer data	has to be issued with the order
Concentration Measurement ²⁾		/CST /Cxx	Standard concentration measurement Advanced concentration measurement, details see table „Advanced Concentration Measurement Options“	
Subrack		/SR1 /SR2	Subrack for 2 converter RCCR31 with mounting Subrack for 4 converter RCCR31 with mounting	
Instruction Manuals		/IE /ID /IF	Quantity of instruction manuals in English Quantity of instruction manuals in German Quantity of instruction manuals in French	n = 1 to 3 selectable ³⁾ n = 1 to 3 selectable ³⁾ n = 1 to 3 selectable ³⁾
Special order		/Z	Special design must be specification an extra sheet	

¹⁾ Select affiliated RCCS3 with the same approval type (e.g. /KS1 with /KS1).
²⁾ For detailed information please see TI 01R04B04-04E-E. Option /K6 of RCCS3 is recommended with concentration measurement.
³⁾ If no instruction manual is selected, only a CD with instruction manuals is shipped with the instrument. More than 3 manuals of one language on request.

Remote cable RCCY03, Model-, Suffix- and Option- Code :

Model	Suffix Code	Option Code	Description	Restrictions
RCCY031 RCCY032 RCCY033 RCCY034			Length in 'meter' Length in 'feet' Length in 'meter' Length in 'feet'	max. ambient temperature 70°C; with /FFx or /FS1: 50°C max. ambient temperature 70°C; with /FFx or /FS1: 50°C max. ambient temperature 105°C; with /FFx or /FS1: 85°C max. ambient temperature 105°C; with /FFx or /FS1: 85°C
Cable ends	-0 -1		No termination, with one termination kit Terminated	
Cable length	Lxxx		Enter the length	max. 300m / 999ft (with /FFx or /FS1 max. 50m / 165ft); the following lengths can be ordered (e.g. 3m = L003): RCCY031-0: 3m, 5m, 10m, 15m, 30m, 50m, 100m, 150m, 200m, 250m, 300m RCCY031-1: 3m, 5m, 10m, 15m, 30m, 50m RCCY032-0: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft, 300ft, 500ft, 1000ft RCCY032-1: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft RCCY033-0: 3m, 5m, 10m, 15m, 30m, 50m, 100m, 150m, 300m RCCY033-1: 3m, 5m, 10m, 15m, 30m, 50m RCCY034-0: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft, 300ft, 500ft, 1000ft RCCY034-1: 10ft, 15ft, 30ft, 50ft, 100ft, 150ft
Options: Hazardous area installation Termination kits Quick delivery		/KS1 /TKxx /QD	Blue cable for Ex-i indication Quantity of additional termination kits Delivery within 24 hours from factory	xx = 01 to 99 only RCCY031-1, L003, L005, L010

Advanced Concentration Measurement Options (others on request), recommended with option /K6:

Option	Display	Components	Concentration range	Temp. range	Source of concentration- / density table
/C01	°Brix	Sugar / Water	0 - 85 °Brix	0 - 80°C	PTB- Messages 100 5/90: „The density of watery Saccharose solutions after the introduction of the international temperature scale of 1990 (ITS1990)“ Table 5
/C02	WT%	NaOH / Water	2 - 50 WT%	0 - 100°C	D'Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd edition, 1967
/C03	WT%	KOH / Water	0 - 60 WT%	54 - 100°C	D'Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd edition, 1967
/C04	WT%	NH ₄ NO ₃ / Water	1 - 50 WT%	0 - 80°C	Data table on request
/C05	WT%	NH ₄ NO ₃ / Water	20 - 70 WT%	20 - 100°C	Data table on request
/C06 ¹⁾	WT%	HCl / Water	22 - 34 WT%	20 - 40°C	D'Ans-Lax, Handbook for chemists and physicists Vol.1, 3rd edition, 1967
/C07	WT%	HNO ₃ / Water	50 - 67 WT%	10 - 60°C	Data table on request
/C09	WT%	H ₂ O ₂ / Water	30 - 75 WT%	4 - 44°C	Data table on request
/C10	WT%	Ethylene Glycol / Water	10 - 50 WT%	-20 - 40°C	Data table on request
/C11	WT%	Amylum = starch / Water	33 - 43 WT%	35 - 45°C	Data table on request
/C12	WT%	Methanol / Water	35 - 60 WT%	0 - 40°C	Data table on request
/C20	VOL%	Alcohol / Water	55 - 100 VOL%	10 - 40°C	Data table on request
/C21	°Brix	Sugar / Water	40 - 80 °Brix	75 - 100°C	Data table on request
/C30	WT%	Alcohol / Water	66 - 100 WT%	15 - 40°C	Standard Cooper Sucar 1967
/C37	WT%	Alcohol / Water	66 - 100 WT%	10 - 40°C	Brazilian Standard ABNT
/C38	VOL%	Alcohol / Water	73 - 100 VOL%	10 - 40°C	Brazilian Standard ABNT

¹⁾ only with material HC

11. TECHNICAL DATA

Table 11-10 : Selection Table Process Connection and Materials, Installation Length

			RCCS 30-32	RCCS 33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39/IR RCCT39/IR		RCCS39/XR RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to ASME B16.5	01A1	½"-150	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01A2	½"-300	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01A3	½"-600	250	250	380	----	----	----	----	----	----	----	----	----	----	----
	01A4	½"-900	----	270	----	----	----	----	----	----	----	----	----	----	----	----
	01A5	½"-900/1500	270	----	400	----	----	----	----	----	----	----	----	----	----	----
	02A1	1"-150	240	240	370	390	500	----	----	----	----	----	----	----	----	----
	02A2	1"-300	240	240	370	390	500	----	----	----	----	----	----	----	----	----
	02A3	1"-600	260	260	390	----	520	----	----	----	----	----	----	----	----	----
	02A4	1"-900	----	320	----	----	----	----	----	----	----	----	----	----	----	----
	02A5	1"-900/1500	320	----	450	----	540	----	----	----	----	----	----	----	----	----
	04A1	1½"-150	250	250	380	390	500	520	600	----	----	----	----	----	----	----
	04A2	1½"-300	250	250	380	390	510	520	600	----	----	----	----	----	----	----
	04A3	1½"-600	270	270	400	----	530	----	620	----	----	----	----	----	----	----
	04A4	1½"-900	----	340	----	----	----	----	640	----	----	----	----	----	----	----
	04A5	1½"-900/1500	340	----	470	----	600	----	----	----	----	----	----	----	----	----
	05A1	2"-150	----	----	----	----	510	520	600	620	----	----	----	----	----	----
	05A2	2"-300	----	----	----	----	510	520	600	620	----	----	----	----	----	----
	05A3	2"-600	----	----	----	----	540	----	630	----	----	----	----	----	----	----
	05A4	2"-900	----	----	----	----	----	720	----	----	----	----	----	----	----	----
	05A5	2"-900/1500	----	----	----	----	660	----	----	----	----	----	----	----	----	----
	06A1	2½"-150	----	----	----	----	----	610	620	----	----	----	----	----	----	----
	06A2	2½"-300	----	----	----	----	----	610	620	----	----	----	----	----	----	----
	06A3	2½"-600	----	----	----	----	----	640	----	----	----	----	----	----	----	----
	06A4	2½"-900	----	----	----	----	----	760	----	----	----	----	----	----	----	----
	08A1	3"-150	----	----	----	----	----	610	620	1000	1020	----	----	----	----	----
	08A2	3"-300	----	----	----	----	----	620	620	1000	1020	----	----	----	----	----
	08A3	3"-600	----	----	----	----	----	640	----	1000	----	----	----	----	----	----
	08A4	3"-900	----	----	----	----	----	760	----	----	----	----	----	----	----	----
	10A1	4"-150	----	----	----	----	----	----	----	1000	1020	1100	----	----	----	----
	10A2	4"-300	----	----	----	----	----	----	----	1000	1020	1100	----	----	----	----
	10A3	4"-600	----	----	----	----	----	----	----	1030	----	1100	----	----	----	----
	12A1	5"-150	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----	----
	12A2	5"-300	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----	----
	12A3	5"-600	----	----	----	----	----	----	----	1040	----	1160	----	----	----	----
	15A1	6"-150	----	----	----	----	----	----	----	----	----	1100	1100	1350	----	----
	15A2	6"-300	----	----	----	----	----	----	----	----	----	1100	1100	1350	----	----
	15A3	6"-600	----	----	----	----	----	----	----	----	----	1200	----	----	----	----
	20A1	8"-150	----	----	----	----	----	----	----	----	----	----	----	1350	----	----
	20A2	8"-300	----	----	----	----	----	----	----	----	----	----	----	1350	----	----
Flanges according to EN 1092-1	01D4	DN 15 PN 40	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01D6	DN 15 PN 100	250	250	380	----	----	----	----	----	----	----	----	----	----	----
	02D4	DN 25 PN 40	240	240	370	390	500	520	----	----	----	----	----	----	----	----
	02D6	DN 25 PN 100	260	260	390	----	520	----	----	----	----	----	----	----	----	----
	04D4	DN 40 PN 40	240	240	370	390	500	520	600	----	----	----	----	----	----	----
	04D6	DN 40 PN 100	320	320	450	----	560	----	620	----	----	----	----	----	----	----
	05D4	DN 50 PN 40	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	05D5	DN 50 PN 63	----	----	----	----	520	----	620	----	----	----	----	----	----	----
	05D6	DN 50 PN 100	----	----	----	----	590	----	660	----	----	----	----	----	----	----
	08D4	DN 80 PN 40	----	----	----	----	----	610	620	1000	1020	----	----	----	----	----
	08D5	DN 80 PN 63	----	----	----	----	----	620	----	1000	----	----	----	----	----	----
	08D6	DN 80 PN 100	----	----	----	----	----	730	----	1000	----	----	----	----	----	----
	10D2	DN 100 PN 16	----	----	----	----	----	----	----	----	----	1100	----	----	----	----
	10D4	DN 100 PN 40	----	----	----	----	----	----	----	1000	1020	1100	----	----	----	----
	10D5	DN 100 PN 63	----	----	----	----	----	----	----	1000	----	1100	----	----	----	----
	10D6	DN 100 PN 100	----	----	----	----	----	----	----	1050	----	1100	----	----	----	----
	12D2	DN 125 PN 16	----	----	----	----	----	----	----	----	----	1100	1100	----	----	----
	12D4	DN 125 PN 40	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----	----
	12D5	DN 125 PN 63	----	----	----	----	----	----	----	1000	----	1100	----	----	----	----
	12D6	DN 125 PN 100	----	----	----	----	----	----	----	1100	----	1140	----	----	----	----
	15D2	DN 150 PN 16	----	----	----	----	----	----	----	----	----	1100	1100	1350	----	----
	15D4	DN 150 PN 40	----	----	----	----	----	----	----	----	----	1100	1100	1350	----	----
	15D5	DN 150 PN 63	----	----	----	----	----	----	----	----	----	1140	----	----	----	----
	15D6	DN 150 PN 100	----	----	----	----	----	----	----	----	----	1180	----	----	----	----
	20D2	DN 200 PN 16	----	----	----	----	----	----	----	----	----	----	----	1350	----	----
	20D4	DN 200 PN 40	----	----	----	----	----	----	----	----	----	----	----	1350	----	----

Table 11-10 : Selection Table Process Connection and Materials, Installation Length (continued)

			RCCS 30-32	RCCS 33	RCCS34 RCCT34		RCCS36 RCCT36		RCCS38 RCCT38		RCCS39 RCCT39		RCCS39/IR RCCT39/IR		RCCS39/XR RCCT39/XR	
			SH	SH	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC	SL	HC
Flanges according to JIS B 2220	01J1	DN 15 10K	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	01J2	DN 15 20K	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	02J1	DN 25 10K	240	240	370	390	500	----	----	----	----	----	----	----	----	----
	02J2	DN 25 20K	240	240	370	390	500	----	----	----	----	----	----	----	----	----
	04J1	DN 40 10K	240	240	370	390	500	520	600	----	----	----	----	----	----	----
	04J2	DN 40 20K	240	240	370	390	500	520	600	----	----	----	----	----	----	----
	05J1	DN 50 10K	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	05J2	DN 50 20K	----	----	----	----	500	520	600	620	----	----	----	----	----	----
	08J1	DN 80 10K	----	----	----	----	----	----	600	620	1000	1020	----	----	----	----
	08J2	DN 80 20K	----	----	----	----	----	----	600	620	1000	1020	----	----	----	----
	10J1	DN 100 10K	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	10J2	DN 100 20K	----	----	----	----	----	----	----	----	1000	1020	1100	----	----	----
	12J1	DN 125 10K	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	12J2	DN 125 20K	----	----	----	----	----	----	----	----	1000	1020	1100	1100	----	----
	15J1	DN 150 10K	----	----	----	----	----	----	----	----	----	----	1100	1100	----	----
	15J2	DN 150 20K	----	----	----	----	----	----	----	----	----	----	1100	1100	----	----
Clamp DIN	01S4	DN 15	240	240	----	----	----	----	----	----	----	----	----	----	----	----
	02S4	DN 25	240	240	370 *)	----	----	----	----	----	----	----	----	----	----	----
	04S4	DN 40	240	240	370	----	500 *)	----	----	----	----	----	----	----	----	----
	05S4	DN 50	----	----	----	----	500	----	600 *)	----	----	----	----	----	----	----
	06S4	DN 65	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S4	DN 100	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
Tri-Clamp	01S8	½"	240	240	----	----	----	----	----	----	----	----	----	----	----	----
	02S8	1"	240	240	370 *)	----	----	----	----	----	----	----	----	----	----	----
	04S8	1½"	240	240	370	----	500 *)	----	----	----	----	----	----	----	----	----
	05S8	2"	----	----	----	----	500	----	600 *)	----	----	----	----	----	----	----
	08S8	3"	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S8	4"	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
DIN11851	02S2	DN 25	240	240	370	----	----	----	----	----	----	----	----	----	----	----
	04S2	DN 40	----	----	----	----	500	----	----	----	----	----	----	----	----	----
	05S2	DN 50	----	----	----	----	----	----	600	----	----	----	----	----	----	----
	10S2	DN 100	----	----	----	----	----	----	----	----	1000	----	----	----	----	----
	41G9	G¼" female	260	260	----	----	----	----	----	----	----	----	----	----	----	----
	01G9	G½" female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	23G9	G¾" female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	41T9	NPT¼" female	260	260	----	----	----	----	----	----	----	----	----	----	----	----
	01T9	NPT½" female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	23T9	NPT¾" female	260	260	390	----	----	----	----	----	----	----	----	----	----	----
	*) not possible with Option SFx, SA, SE															

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APPENDIX 1. SOFTWARE CHANGE HISTORY

Table A1-1 Converter Software Change History

Release date	Label	SW Rev	Dev Rev	Changes	Instruction Manual
14.08.2003	1.02.xx	2	1	HART communication added	IM 01R04B04-00E-E ed. 1
06.07.2004	1.03.xx	3		Correction constants introduced	IM 01R04B04-00E-E ed. 4
14.12.2005	1.04.xx	4		„All alarms“ for status out introduced, new density unit introduced, negative LRV value allowed	IM 01R04B04-00E-E ed. 5
14.06.2006	1.05.xx	5		Standard and normal volume (flow) units introduced, energy totalizer and flow velocity introduced	IM 01R04B04-00E-E ed. 5
20.07.2007	1.06.xx	6	2	7 digits for values, new correction constants introduced, new sensor model 39/XR introduced	IM 01R04B04-00E-E ed. 6
07.02.2008	1.07.xx	7	3	Standard concentration measurement added, temperature offset compensation and sensor correction constants introduced	IM 01R04B04-00E-E ed. 7
24.03.2011	1.08.xx	8	4	Additional totalizer with free assignment, new handling for non-SI units, improved scrolling in menu and input of numbers	IM 01R04B04-00E-E ed. 8

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APPENDIX 2. Safety Instrumented Systems Installation



WARNING

The contents of this appendix are cited from exida.com safety manual on the Rotamass 3 series Coriolis Mass Flow and Density meter specifically observed for the safety transmitter purpose. When using the Rotamass 3 for Safety Instrumented Systems (SIS) application, the instructions and procedures in this section must be strictly followed in order to preserve the transmitter for that safety level.

A2.1 Scope and Purpose

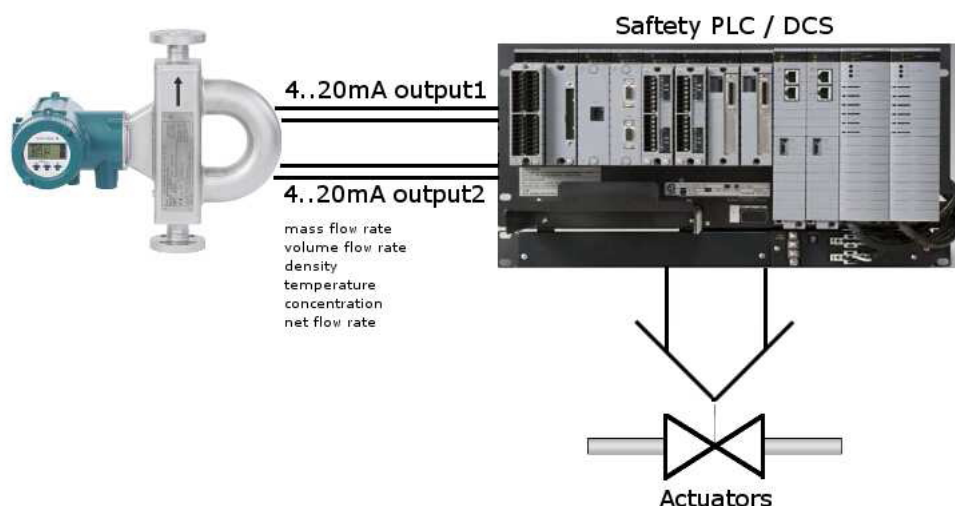
This document provides an overview of the user responsibilities for installation and operation of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter in order to maintain the designed safety level. Items that will be addressed are proof testing, repair and replacement of the flowmeter, reliability data, lifetime, environmental and application limits, and parameter settings.

A2.2 Using Rotamass 3 for a SIS Application

A2.2.1 Safety Function

This flowmeter is intended for use as a mass flow, fluid density and fluid temperature measurement component in a Safety Instrumented System. It has two 4-20 mA analog outputs, two passive pulse outputs/status outputs and one status input. The flowmeter may be used with the two 4 – 20 mA outputs to feed signals to a logic solver that is part of the safety instrumented function (SIF) as shown in Figure A2-1. The fault annunciation mechanism is an out of range analog current. In order to take credit for the automatic diagnostics in the flowmeter, this annunciation mechanism must be connected.

Figure A2-1 Example Safety Instrumented Function



A2.2.2 Safety Accuracy

The flowmeter has a specified safety accuracy of 2%. This means that internal component failures are listed in the device failure rate if they will cause an error of 2% or greater.

A2.2.3 Diagnostic Response Time

The flowmeter will report an internal failure within 3 minutes of fault occurrence for amplitude errors and within 1 second of fault occurrence for all other errors (e. g. frequency error, signal fault).

A2.2.4 Setup

During installation the flowmeter must be setup with engineering unit parameters. This is typically done with a handheld device. These parameters must be verified during the installation to insure that the correct parameters are in the flowmeter. Engineering range parameters can be verified by reading these parameters from the optional local display or by checking actual calibration of the flowmeter.

Calibration of the flowmeter must be done after parameters are set.

A2.2.5 Proof Testing

The objective of proof testing is to detect failures within the flowmeter that are not detected by the diagnostics of the flowmeter. Of main concern are undetected failures that prevent the safety instrumented function from performing its intended function. The frequency of the proof tests (or the proof test interval) is to be determined in the reliability calculations for the safety instrumented functions for which the flowmeter is applied. The actual proof tests must be performed more frequently or as frequently as specified in the calculation in order to maintain required safety integrity of the safety instrumented function. The following tests need to be specifically executed when a proof test is performed. The results of the proof test need to be documented and this documentation should be part of a plant safety management system. Failures that are detected should be reported to Yokogawa.

Step	Action
1.	Bypass the safety function and take appropriate action to avoid a false trip
2.	Verify current output with flow tube filled and zero flow rate within stated accuracy
3.	Verify reasonability of current output with flow tube filled at two different flow rates able to be independently estimated to approximately 10% accuracy
4.	Use display or digital communications to retrieve process temperature measurement and verify against independent measurement
5.	Use display or digital communications to retrieve any diagnostics and take appropriate action.
6.	Use display or digital communications to send the flowmeter to the high and low alarm level output state current and verify that the analog current reaches these values ¹ .
7.	Remove the bypass and otherwise restore normal operation

¹ This tests low loop voltage and high loop impedance related failures.

When all the tests listed above are executed a proof test coverage of 71.8% can be claimed.

This proof test in combination with automatic diagnostics will detect 94% of possible DU failures.

The following tools need to be available to perform proof testing.

- Flowmeter display or alternatively for digital communication: HART Handheld, PRM or FieldMate
- Measurement instrument to verify output current
- Reference temperature measurement as close as possible to the meter under test.

The person(s) performing the proof test of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter should be trained in SIS operations including bypass procedures, flowmeter maintenance and company management of change procedures.

A2.2.6 Repair and Replacement

Maintenance information can be found in section 8, Self-diagnostic and Troubleshooting of the User's Manual ROTAMASS 3 Series Coriolis Mass Flow and Density Meter Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E.

If repair is to be performed with the process online the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter will need to be bypassed during the repair. The user should setup appropriate bypass procedures for that.

Contact the Yokogawa sales office if this instrument requires repair

The person(s) performing the repair and / or replacement of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter should have a sufficient skill level.

A2.2.7 Startup Time

The flowmeter will generate a valid signal within 20 seconds of power-on startup with the default 3 second dampening time. Increasing the configurable dampening time adds to the startup time.

A2.2.8 Firmware Update

In case firmware updates are required they will be performed at factory. The replacement responsibilities are then in place. The user will not be required to perform any firmware updates.

A2.2.9 Reliability Data

A detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report is available from Yokogawa with all failure rates and failure modes. The Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is intended for use in a Low Demand Mode. Low Demand Mode means the average interval between dangerous conditions occurs infrequently.

The Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is certified up to SIL2 for use in a simplex (1oo1) configuration, depending on the PFDavg calculation of the entire Safety Instrumented Function. The development process of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is certified up to SIL3, allowing redundant use, with hardware fault tolerance of 1, of the flowmeter up to this Safety Integrity Level, depending on the PFDavg calculation of the entire Safety Instrumented Function. When using the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter in a redundant configuration, the use of a common cause factor (β -factor) of 2% is suggested.

A2.2.10 Lifetime Limits

The expected lifetime of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter is 10 years. The reliability data listed in A2.2.9 is only valid for this period. The failure rates of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter may increase sometime after this period. Reliability calculations based on the data listed in A2.2.9 for Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter lifetimes beyond 10 years may yield results that are too optimistic, i.e. the calculated Safety Integrity Level will not be achieved.

A2.2.11 Required Parameter Settings

The following parameters need to be set in order to maintain the designed safety integrity.

High – Low (Burn-out) jumper	To specify if the output should go high (≥ 21.6 mA) or low (≤ 3.6 mA) upon detection of an internal failure.
Write Protect (Security)	The write function should be disabled.

A2.2.12 Environmental Limits

The environmental limits of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter are specified in the User's Manual, ROTAMASS 3 Series Coriolis Mass Flow and Density Meter, Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E.

A2.2.13 Application Limits

The application limits of the Yokogawa ROTAMASS 3 Series Coriolis Mass Flow and Density Meter are specified in the User's Manual, ROTAMASS 3 Series Coriolis Mass Flow and Density Meter, Integral Type RCCT3, Remote Type RCCF31 + RCCS3, Remote Type RCCR31 + RCCS3, IM 01R04B04-00E-E. If the flowmeter is used outside of the application limits the reliability data listed in A2.2.9 becomes invalid.

A2.3 Definitions and Abbreviations

A2.3.1 Definitions

Safety	Freedom from unacceptable risk of harm
Functional Safety	The ability of a system to carry out the actions necessary to achieve or to maintain a defined safe state for the equipment / machinery / plant / apparatus under control of the system
Basic Safety	The equipment must be designed and manufactured such that it protects against risk of damage to persons by electrical shock a other hazards and against resulting fire and explosion. The protection must be effective under all conditions of the nominal operation and under single fault condition
Verification	The demonstration for each phase of the life-cycle that the (output) deliverables of the phase meet the objectives and requirements specified by the inputs to the phase. The verification is usually executed by analysis and / or testing
Validation	The demonstration that the safety-related system(s) or the combination of safety-related system(s) and external risk reduction facilities meet, in all respects, the Safety Requirements Specification. The validation is usually executed by testing
Safety Assessment	The investigation to arrive at a judgment - based on evidence - of the safety achieved by safety-related systems

Further definitions of terms used for safety techniques and measures and the description of safety related systems are given in IEC 61508-4.

A2.3.2 Abbreviations

FMEDA	Failure Mode, Effects and Diagnostic Analysis
SIF	Safety Instrumented Function
SIL	Safety Integrity Level
SIS	Safety Instrumented System
SLC	Safety Lifecycle

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Please refer to the European website (www.yokogawa.com/eu) to contact your nearest representative.



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